SCIENTIFIC AMERICAN

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August 1, 1914

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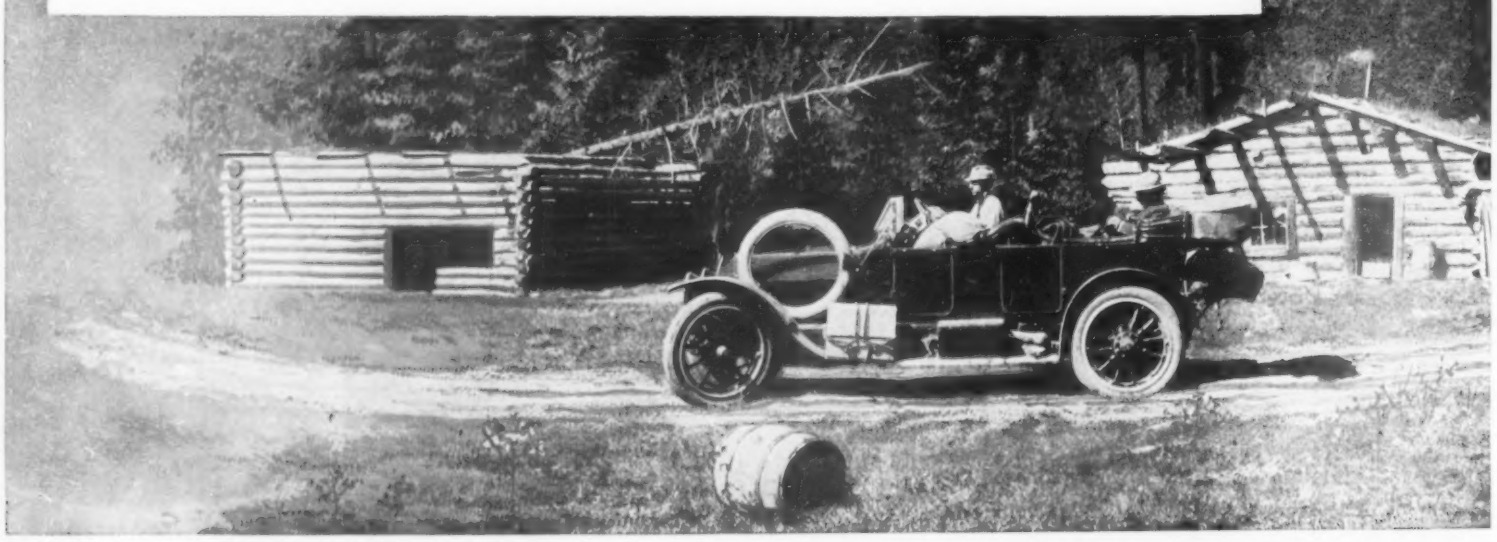

SEVENTIETH YEAR

SCIENTIFIC AMERICAN

THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CXI
NUMBER 5.

NEW YORK, AUGUST 1, 1914

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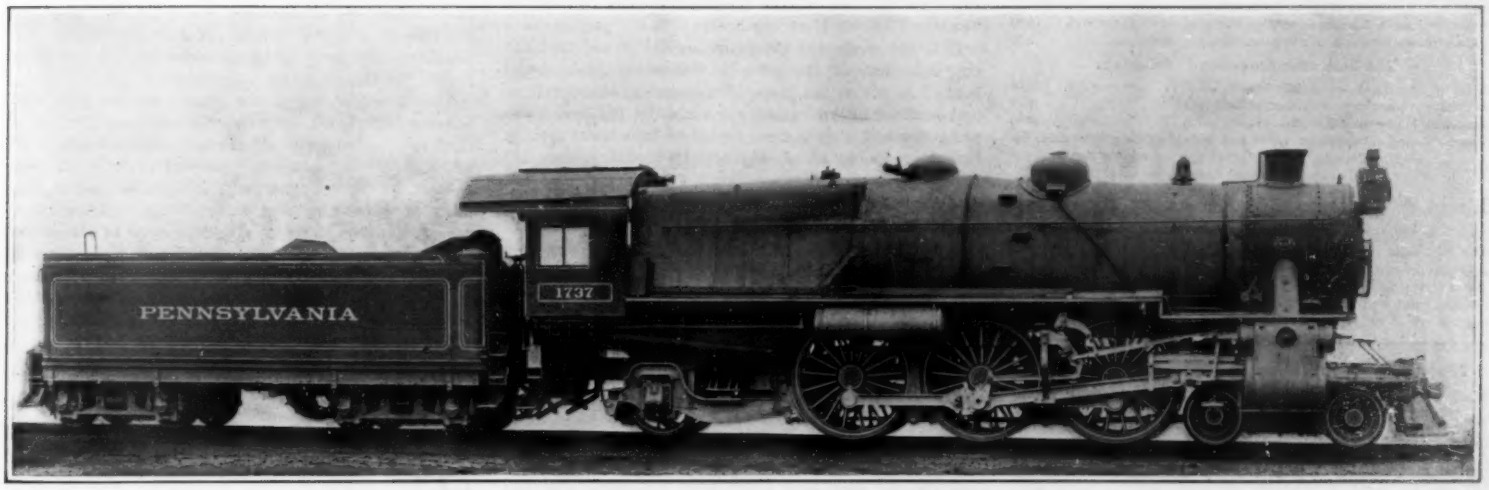


Two-cylinders (simple) 27-inch diameter by 28-inch stroke. Steam pressure, 205 pounds. Heating surface, 5,766 square feet. Diameter driving wheels, 80 inches.

New Pacific type superheater, passenger locomotive for the Pennsylvania Railroad.

Recent American and European Express Locomotives

THE two powerful locomotives herewith illustrated represent two of the most recent designs in this country and abroad, of express passenger locomotives. One was built by the Pennsylvania Railroad for its heavy service between Altoona and Pittsburgh; the other is of German make, for the Roumanian State Railways.

During the last few years the Pennsylvania Railroad Company has felt the need of a larger freight locomotive for use on the main line, between Altoona and Pittsburgh, in order to reduce double-heading to a minimum, and to avoid breaking up trains arriving at Altoona and Pittsburgh before sending them forward over the Pittsburgh division. It was also thought desirable to experiment with a very heavy Pacific type locomotive for passenger service on this same division. With this object in view a Mikado locomotive, which bears Pennsylvania Railroad classification "L-1-s," and a Pacific type locomotive, which bears Pennsylvania Railroad classification "K-4-s," have been developed. The first "L-1-s" locomotive was placed in service about the 1st of May of this year, while the first "K-4-s" locomotive was placed in service last June.

Inasmuch as the road clearance is somewhat limited, also the weight per pair of driving wheels is limited to 65,000 pounds with a 5 per cent margin for scale variations, and the dynamic augment of the unbalanced reciprocating parts at 70 miles per hour is limited to 30 per cent of the weight on the drivers, it was necessary to keep the locomotives within restricted limits and make the revolving and reciprocating parts as light as possible, and at the same time maintain the necessary strength. Further, it was found desirable to maintain as many parts as possible interchangeable in these two types of locomotives, and to use as many parts as possible which are embodied in the design of the "E-6-s" locomotives.

The locomotives are equipped with all-steel cabs, which are considerably smaller than the standard type of cab used on the Pennsylvania Railroad. On account of the fact that the locomotives are equipped with screw reverse gear a cab of great length is not necessary, and it is believed that the shorter cab will give the engine crews better opportunity to observe signals.

The running gear has been lightened as much as possible by the use of heat-treated material for driving axles, crank-pins, piston rods and side and main rods. The axles, crank-pins, wrist-pins, and piston rods are provided with holes through them with a view of reducing the weight and at the same time providing a better chance for the heat-treatment to take effect.

The trailer truck is what is known as the "K-W" truck, this truck being interchangeable on the "E-6-s," "L-1-s," and "K-4-s" locomotives.

The driver brake arrangement is particularly interesting on account of the arrangement of cylinders, this arrangement being necessary to provide sufficient space for two 16-inch cylinders which are necessary for proper control.

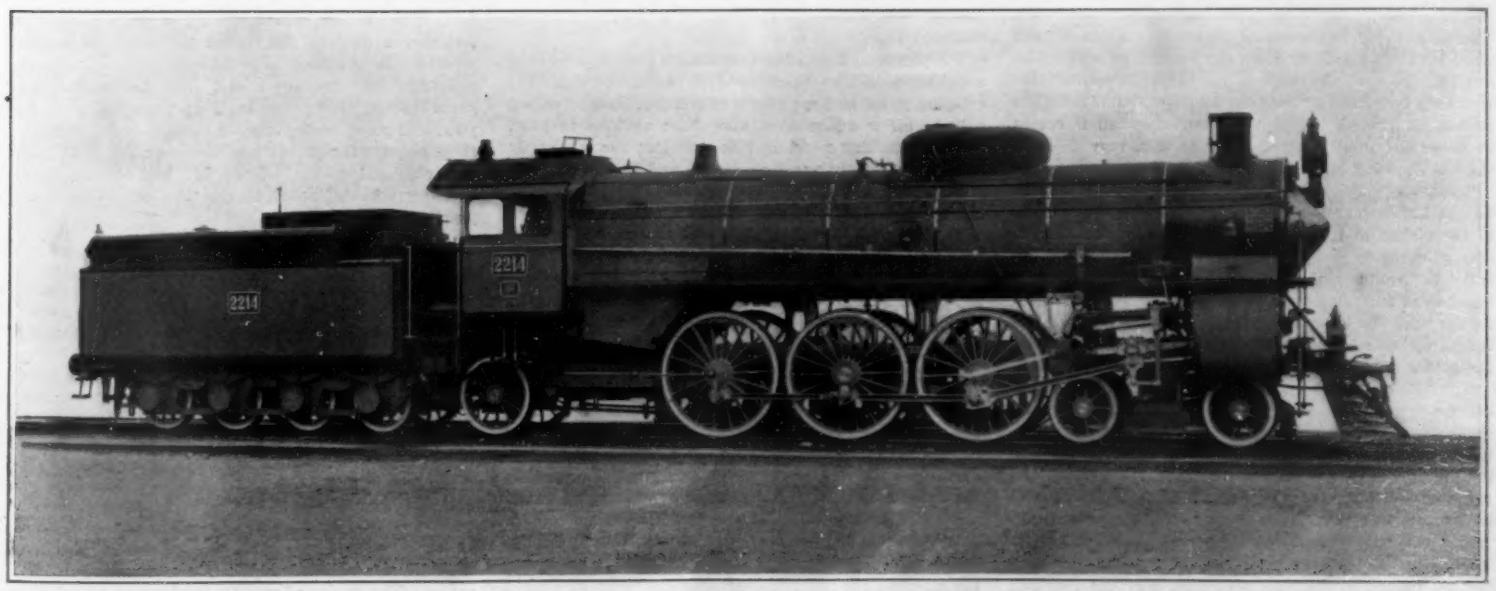
The locomotives are equipped with Schmidt smoke tube superheaters and security fire brick arch.

Subjoined are the leading particulars of the Pacific type, "K-4-s" express locomotive as herewith illustrated.

Tractive Power — Mean Effective Pressure = 4/5 Boiler Pressure, Pounds	41,845
Estimated Total Weight in Working Order, Pounds	305,000
Estimated Total Weight on Drivers, Pounds	200,000
Kind of Cylinders	Simple
Diameter and Stroke of Cylinders	27 x 28 inches
Kind and Size of Valves	12-inch Piston
Driving Wheels, Diameter over Tires	80 inches
Type of Boiler	Belpaire
Working Pressure, Pounds	205
Outside Diameter of First Course in Barrel	78½ inches
Fire Box, Width and Length	80 x 126 inches
Tubes, Number and Outside Diameter	237—2¼ inches
Tubes, Length	228 inches
Heating Surface, Total, Square Feet	4,035.4
Superheater Heating Surface, Square Feet	1,153.9
Grate Area, Square Feet	70.0
Center of Boiler above Rail	10 feet 1 inch
Equivalent Heating Surface	5,766 sq. feet

Our other illustration shows the first of a series of Pacific type express locomotives which have recently

(Concluded on page 88.)



Four cylinders (simple), 16⅞-inch diameter by 25⅝-inch stroke. Steam pressure, 185 pounds. Heating surface, 3,373 square feet. Diameter of driving wheels, 73 inches.

New Pacific type passenger locomotive for the Roumanian State Railways.

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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

Tuning Up the Cup Defenders

THE completion at Newport on August 18th of the series of races between the cup defenders, which was held under the auspices of the New York Yacht Club and the Newport Yacht Racing Association, marked the close of the first stage of the tuning up trials of the three boats which have been built to defend the "America's" cup. The yachts met for the first time on June 2nd, and it was intended that thereafter, during the following six weeks, there should be a practically continuous series of trials. The weather, however, was by no means favorable; and the necessity of withdrawing the yachts temporarily for changes and adjustments made considerable inroads on the programme, with the result that, as a whole, the races thus far held must be considered to have been rather disappointing. The most satisfactory trials were the three races held off Sandy Hook, when the winds were of reasonable strength and fairly constant. It must be admitted, though, that the average weather conditions were such as are liable to obtain three days out of four off the Sandy Hook course in September; and, therefore, to this extent, the results of the trials may be considered to give a satisfactory line upon the respective merits of the three yachts.

As thus far developed, the strong and weak points of the three cup defenders are in remarkable agreement with the predictions which we made in our issue of May 2nd, when we published the plans of the boats; but it must be remembered that, prior to the meeting of the candidates, "Resolute" had been afloat for about one month, during which she had been subjected to a very thorough tryout. Although, during the six weeks of racing, "Resolute" has won the majority of the contests, her closest competitor, "Vanitie," has shown a steady improvement, gradually, whenever the wind held true, cutting down the margin by which she has been beaten. In three of the races "Resolute" has won only by virtue of her time allowance, and it begins to look as though the Cup Committee, when it comes to make the final selection, will have a very delicate task in choosing between the two yachts.

"Defiance," which has been withdrawn by her owners, in her last two or three races had begun to show a surprising and, in view of her early failures, a totally unexpected improvement of form, and particularly to windward in light breezes. That she could make such further development as to be a serious contender with the other two yachts was unlikely, particularly in view of the limited time that remained before the actual cup races, which start on September 10th.

The "Resolute" has proved to be a remarkably well-balanced yacht, excellent on all points of sailing and phenomenally fast in light airs. Her best work, relatively, has been done in going to windward, and the lighter the wind the greater the ease with which she has drawn away from her opponents. Much of this advantage, however, is due to the admirable manner in which she has been sailed by her Corinthian skipper, who is in absolute charge of the yacht during her races. Almost invariably she has been first over the line and in the windward position, consequently she has reaped all the advantages which come to a leading yacht, particularly when the winds are light and fluky. In reaching, her performance is below the average of her work on other points of sailing, but up and down the wind she is a truly phenomenal boat.

"Vanitie," as we predicted, shows to best advantage with started sheets; and in reaching, particularly if there is weight in the wind, she is decidedly the fastest boat of the three. In windward work, however, she has shown a steady improvement, and the substitution of a gaff and club-top-sail spars of aluminium for those of wood, and the removal of loose ballast have added considerably to her speed, particularly in light airs. In future races, if the "Vanitie" should be handled with more snap and daring in the maneuvering at the start, and captures her share of the windward positions, it will be nip and tuck between her and "Resolute" for the rest of the season, with the chances in "Vanitie's" favor if strong breezes should prevail.

It is not stretching the point too far to say that the cup defenders of the present season are phenomenal boats. So far as the larger displacement, sharper form and smaller initial stability favored by the new rules are concerned, they not only seem to have done nothing toward reducing speed, but on the contrary have led to the production of exceedingly fast yachts, that are at once light and stanch in construction.

Of the speed of the cup-defending boats in light to moderate yachting weather there can be no doubt whatever. We believe that they could hold their own under these conditions with the 90-foot yachts of the last series of races, and that they might even beat them, boat for boat, without time allowance. In strong winds they would be overpowered. It is just here that this year's boats should cause some uneasiness to the Cup Committee; for unquestionably they are both rather tender. "Defiance" was notably so.

"Shamrock IV," on the other hand, although she carries a much loftier rig, proved to be so stiff that five tons of lead have been taken from her keel. She has been tried in wholesail and reefing breezes, and carried her big sail spread in good shape. It is questionable if either "Resolute" or "Vanitie" could hold her under these conditions; but that she will be able, even in her favorite weather, to save her large time allowance is very doubtful.

Safety First for Automobiles

ONE of the most humanitarian movements undertaken in the broad field of transportation is the present very successful "safety first" movement among the railroads. It is a voluntary effort, conceived and carried out by the railroads of this country, endorsed by the management, appreciated by the employees, and already, as statistics clearly prove, it is resulting in a great saving of life and prevention of injury.

In view of the enormous increase in automobile traffic and the ever-growing daily list of fatalities and injuries, there is a movement on foot in this city to extend the "safety first" principle to the automobile. One of the most prolific causes of accidents is the grade crossing, and nowhere has this menace to the users of automobiles rolled up such a total of killed and wounded as on the crossings of the Long Island Railroad.

We are in thorough agreement with the New York *Herald* in its agitation to bring about safer conditions on Long Island, and it is gratifying to learn that the matter of safeguarding these points of danger is being taken up by several influential bodies, including the various automobile organizations, the Safety First Society of New York, and the officials of the Long Island Railroad itself.

We understand that the railroad contemplates issuing an order to all watchmen and gatemen, ordering that crossing gates be kept closed constantly, and be raised only to allow automobiles and other vehicles to pass. There is nothing novel in this practice; for it already prevails in certain parts of France and England, where it has proved a very effective safeguard to highway traffic. Of course, such an order would have to be issued with discretion, that is to say, with certain limitations; and it could hardly be put in effect at certain points where the traffic is unusually heavy. Such cases, however, would be the exception rather than the rule, and there are hundreds of crossings, not merely on Long Island, but throughout the country, where a "normally closed" order could be put into effect without any serious hindrance to vehicular traffic.

Another practical and very valuable suggestion is that distant signs or signals should be erected a sufficient distance from the railroad crossings, to give the automobile drivers warning that they are approaching the tracks. Distant signals are an essential part of the railroad block signal system, and the arguments in favor of their use on the railroads are fully as forcible when applied to highway traffic. It is suggested that the expense for the proposed warning posts and night signals should be borne jointly by the railroads, the State Highway Commission, and the various counties affected.

Small-boat Crossing of the Atlantic

THERE is no reason why the projected crossing of the Atlantic by a 30-foot Lundin motor lifeboat should not be successful. There are those, indeed, like Thomas Fleming Day, the veteran yachtsman, who claim that, with good seamanship and navigation, there is no greater danger to a small than there is to a large boat in making a long ocean voyage—and surely Mr. Day ought to know. The editor of *The Rudder* believes that our yachtsmen are losing half the fun of yachting by keeping too closely to sheltered waters; and as for the danger, he claims that the greater the offing from land, the less the risk. To prove that he had the courage of his convictions, Mr. Day, a few years ago, started from America in a 25-foot decked yawl of his own design, and sailed the little craft successfully to Europe, making his final mooring in Rome itself, without any mishap whatsoever. Later he repeated the trip in a small motorboat.

The "Lundin" is a motor lifeboat of the type which has been developed since the "Titanic" disaster. It has the broad, shoal body which characterizes boats of this name, is almost completely covered in by a plate-steel cabin, and is provided with a double bottom. The craft is self-bailing and self-righting, and its engines are of sufficient power to give it a speed of about seven miles per hour. Like the Thornycroft motor lifeboats on the "Aquitania," it has a wireless outfit capable of transmitting and receiving over one hundred miles. If the projected trip is made successfully, it will serve to establish the merits of a type of craft two or more of which form the part of the lifeboat equipment of every modern liner.

Another View of the Origin of Life

THE origin of life, and the part probably played by sunlight in this process, formed the subject of a paper by Prof. Benjamin Moore, F.R.S., and Mr. Arthur Webster, presented at the last meeting of the British Association, in which the authors reported the results of extensive laboratory experiments which appear to have a bearing on the question. They first pointed out that the whole world of living plants and animals, as we know it, depends for its continuance upon the synthesis of organic compounds from inorganic by the green coloring matter of the plant acting as a transformer of light energy into chemical energy. However, chlorophyll, which acts as the transformer, is one of the most complex of known organic substances, and therefore represents an advanced stage of evolution. Starting from a purely inorganic world, without a trace of organic matter, what is the first step in the production of the latter? The authors find that when dilute solutions of colloidal ferric hydroxide, or the corresponding compound of uranium, are exposed to strong sunlight, or the light of a mercury arc, there are synthesized the same organic compounds that are at present formed as the first stage in the process of organic synthesis by the green plant, viz., formaldehyde and formic acid. As a planet cools down, first only elements would be present, then binary compounds, and next simple crystalloidal salts. Then, by the union of single molecules into groups of fifty or sixty, colloidal aggregates would appear. As these colloidal aggregates increase in complexity, they also become more delicately balanced in structure, and are metastable or labile, i. e., they are easily destroyed by sudden changes in environment, but are peculiarly sensitive to energy changes, and can take up energy in one form and transform it to another. These labile colloids take up water and carbon dioxide, and, under the action of sunlight, produce the simplest organic structures. The latter, reacting with themselves and with nitrogenous inorganic matter, continue to build up more and more complex, and more labile, organic colloids, until ultimately these acquire the property of transforming light energy into chemical energy. Thus life has originated, and probably still originates, by the "law of molecular complexity."

Measuring Turbine Steam Consumption.—For the steam turbine with surface condensing, it is an easy matter to check up steam consumption by weighing the amount of condensed water. An automatic device is now installed in the well-known Allgemeine turbine establishment for automatic weighing and recording of condensed water of a turbine plant, consisting of two measuring tanks mounted upon pivots, with a water feed placed above them. One tank fills up by water flowing down into it, and when full, it tips over to some extent and allows the water to flow out by a pipe, at the same time shifting the feed stream upon the second tank, and so on. At each movement of the two tanks there is made a record in a suitable way, the whole being quite automatic. The device affords an excellent means of determining steam consumption of a turbine, either upon special tests of new machines or for the regular running of a turbine plant.

Science

Paraffine Baths for Rheumatism.—At a recent session of the Academy of Medicine in Paris, M. Barthe de Sanafort describes the happy results obtained in certain cases by the use of waxy envelops raised to a temperature of not less than 50 deg. Cent. The mediums used were the mineral waxes (paraffins, ambrine, etc.). These maintain a temperature above 43 deg. Cent. for 24 hours without being renewed. They give excellent results in rheumatism, gout, arthretis, lumbago, sciatica, etc. The author likewise covers wounds, ulcers and burns with a paraffined mixture (ambrine) raised to 80 deg. Cent. or more, which in passing from the liquid to the solid state instantly forms a protective and sterilizing shell over these losses of substance in whose shelter the tissues rapidly heal.—*Cosmos.*

An American Precursor of Darwin.—The curious coincidence which led Darwin and Wallace to hit upon the same theory of evolution at about the same time, is heightened by the fact that a little treatise, published by an American, G. W. Sleeper, at Boston, in 1849, contains the fundamental principles of the theory. Darwin first had the idea in 1842, but it was not published till 1856. Sleeper's brochure has been sent to England by an American gentleman and will receive the attention of the Linnean Society of London. In it, one finds not mere vague anticipations of the theory, but definite statements such as "everywhere around us we see the pitiless struggle for life, the useless perishing, the useful persisting and progressing," and farther on "man and the ape descend from some common type," etc.

Sanitation in West Africa.—On the occasion of unveiling relief portraits of the late Joseph Chamberlain and his son, Austen Chamberlain, as a memorial to the work done by these officials on behalf of tropical medicine, Mr. Harcourt, the British colonial secretary, gave an account of the results accomplished by the London School of Tropical Medicine. Aside from the discoveries made in its laboratories, it has benefited humanity by sending its students abroad to countries where their special knowledge and skill was most needed. Perhaps the most striking example of the progress made in tropical medicine is the west coast of Africa, a region notorious beyond almost all others for deadly climatic conditions. In the past ten years, the death-rate among British officers on this coast has been reduced from 28 to 8 per 1,000, and the invaliding rate from 62 to 28.

Guilbert's Weather Forecasts.—In a communication to the French Academy of Sciences, M. Gabriel Guilbert reports the results that have attended the application of his empirical method of weather prediction in a series of no less than 9,000 forecasts, published in a Parisian newspaper. This method of forecasting, which seeks an indication of coming changes in barometric pressure, such as the paths of cyclonic disturbances, from the observed relation between the force and direction of the winds to the force and direction appropriate to the existing isobars and barometric gradients, was first announced by its author in 1891, and attained great prominence among meteorologists when M. Guilbert won the prize in a weather forecasting competition held in connection with the international exposition at Liège in 1905. In the series of forecasts above mentioned, it is claimed that the movements of cyclones in all parts of Europe were correctly forecast 24 hours in advance in 89 per cent of the cases; variations of pressure in 86 per cent; and weather conditions in more than 80 per cent. It is claimed, moreover, that nearly all the failures were due, not to the method of prediction, but to the sparsity of weather reports from certain regions or other analogous causes.

Laboratory Studies of Halos.—Of the very numerous recorded forms of solar and lunar halos, several are excessively rare; some, in fact, have been reported only once or twice in the history of science. Moreover, such phenomena are commonly of brief duration (sometimes lasting only a minute or two), and so local in occurrence that the individual student of halos may hope to see only a few of the rarer forms in the course of a lifetime. Thus it is said that the French meteorologist Renou, who searched the sky constantly for halos during fifty years, was never rewarded with a glimpse of the oblique arcs of the anthelion, the halo of Hevelius, the paranthelia of 90 degrees, or of several other rare forms. It is no wonder, therefore, that the theory of halos is still fragmentary. At a recent meeting of the Meteorological Society of France, M. Lemoine suggested that this problem might be attacked profitably from the laboratory. The various forms of ice crystal occurring in nature might be produced artificially, and their optical properties could then be studied under favorable conditions. Such an undertaking would probably throw much light upon the mode of occurrence and the precise shape and position of many of the rare halos, and is well worthy of attention on the part of physicists. Various other moot questions in atmospheric optics might also be investigated in the laboratory, e. g., the question recently raised by Simpson as to whether ice crystals are able to produce coronas, as was formerly generally believed, or whether these phenomena are not always due to droplets of water.

Aeronautics

New Altitude Record with an Aeroplane.—On July 9th, at Johannisthal Aerodrome, near Berlin, Germany, Otto Linnekogel soared to a height of 21,654 feet, or 4.1 miles in his monoplane, said to be the highest altitude record yet attained by an aeroplane.

Braced Aeroplane Surfaces.—A patent, No. 1,105,510, to John George Aulsebrook Kitchen and Isaac Henry Storey, of Lanchester, England, provides a special construction of plane supporting surfaces, whereby to secure greater rigidity, compactness of form and stability.

Reinforced Gas Containing Envelope.—In a patent, No. 1,100,762, issued upon the invention of Hermann Naatz, of Bitterfeld, Germany, is provided a special means for strengthening and reinforcing the gas containing envelopes of airships transversely for the purpose of preventing them from becoming deformed, especially at their overhanging ends.

A Novel Parachute Attachment.—Otto Kroop, of West Hoboken, N. J., has secured patent, No. 1,101,196, for a parachute attachment for aeroplanes, including means for effectively and practically instantaneously setting the parachute in operative position irrespective of the angle at which the aeroplane may be tipped, either longitudinally or laterally.

Promised Development of Army Flying Corps.—Having available July 1st an appropriation of $250,000 for aeronautics, Brig. Gen. J. P. Scriven, Chief Signal Officer, and Asst. Chief, Lieut. Col. Samuel Reber, have prepared plans looking to a competition by the builders and inventors of aeroplanes in America. It is expected that large purses will be offered and that the competition will take place at San Diego, Cal., during October and November.

The Military Value of Cross-country Flying.—Cross-country flying forms, perhaps, the most important part of a pilot's training, but in practice opportunities for making long cross-country flights are rare. Accordingly, in Germany, military pilots are encouraged to compete for the manifold competitions instituted by the National Aerial Committee. Cross-country races are held, in which both civilian and military competitors take part, while in all the big races a military observer is carried as passenger.

Sikorsky Aerobus Records.—According to the daily press, the Russian aeronaut Sikorsky is making some remarkable flights with his great aeroplane, or "aerobus," especially in the way of carrying numerous passengers. The following new records are listed: On June 19th, he mounted with 10 passengers on board to a height of 2,000 meters (6,200 feet) in 1 hour 26 minutes 21 seconds; and during the night he made a flight with 6 passengers which lasted for 6 hours 33 minutes 10 seconds. The aeroplane is fitted with two Salmson motors of the 200 horse-power type.

Aircraft v. Submarine.—It is undoubtedly true that, under certain conditions, it is possible from a good altitude to perceive objects at a certain depth below the surface, but this is mainly the case with calm, clear water, with a favorable light. In the choppy grey waters which abound round British coasts, a submarine would rarely be detected, more especially as the view from the pilot's and observer's seats is, in the majority of cases, most defective at the present time, and the fierce slip-stream from the propeller revolving in front, added to the high speed of travel, render the use of goggles imperative. But, in the opinion of a writer in the London *Daily Telegraph*, minor difficulties such as these may, and no doubt will, be overcome in time, and experience alone can show in how far the aeroplane will serve as a protection against submarines.

Status of the British Industry.—On the whole, the British aviation industry may be said at the present time to be in a more satisfactory condition than ever before in its brief existence, according to the London *Daily Telegraph*. There is first the growth and development of aviation itself, involving a natural expansion of the industry. In the second place, there is the remarkable increase in the effective strength of both branches of the air service. The military wing at the present time possesses five squadrons, each of which has nearly been brought to its full establishment strength, both in men and machines, and, more important still, in transport material, though adequate reserves and the requisite stock of spare parts are still, it is to be feared, lacking. These squadrons, completed by some additional flights, are now mobilized and engaged in concerted manœuvres on Salisbury Plain. They comprise, roughly, about seventy effective aeroplanes, which is not wholly unsatisfactory for the time being, though, including reserves, the full establishment strength of the eight squadrons, which, on paper, constitute the military wing, amounts to no fewer than 200 aeroplanes, irrespective of those required for tuition at the Central Flying School. It must be remembered, and the fact is at last obtaining recognition in official quarters, that for every aeroplane in commission there is one lying up; it is this exceptionally heavy wear and tear that necessitates such unusually large reserves.

Inventions

Stenographic Writing Machine Patents.—A number of patents, Nos. 1,098,113 to 1,098,118, inclusive, have been issued to Ward S. Ireland, of Owensboro, Ky., for sundry improvements in stenographic writing machines.

Electrical Heater for Concrete Buildings.—William S. Haddaway, Jr., of New York city, has patented, No. 1,098,436, an electric heating system adapted for heating concrete buildings, and in which the metallic reinforcements are utilized as elements of the heating system.

Putting Indoors for the Golfer.—Carl J. Leudor, of Mount Vernon, N. Y., has secured patent 1,101,203 for an indoor golf putting cup providing a device by which a golfer may practice indoors in such manner as to improve his play upon the actual putting green.

A Charles Francis Jenkins Patent.—Charles Francis Jenkins, of Washington, D. C., has secured patent, No. 1,098,805, for an internal combustion engine, providing a two-cycle engine in which the fuel supply may be reduced to any practically desired extent without danger of missing explosions or introducing any harmful features.

Fire Protection in the Patent Office.—After consideration of other systems of fire protection, contract has been awarded for the installation in the U. S. Patent Office of an automatic sprinkler system for the protection of some of the valuable records stored in or upon inflammable supports, especially at points where the fire danger seems greatest.

A Veteran Patent Office Examiner.—Dr. A. G. Wilkinson, the dean of the corps of Patent Office examiners, celebrated the fiftieth anniversary of his connection with the office on July 1st, 1914, receiving the congratulations of the Commissioner and his official associates. His first assistant, Mr. Wm. Hutchinson, with forty-seven years in the office to his credit, is not far behind the Doctor in point of service.

A Device for Cleaning Bottles.—The great difficulty in removing deposits from the inside of bottles is well known, and often they have to be discarded for this reason. A Swiss inventor makes an ingenious device in the shape of a rather large metal basin with a middle upright tube. Sand is put in the basin, and a hose connects with the water supply. A simple arrangement allows of projecting sand and water into the bottle which is fitted over the tube, and this cleans it effectually. Then the sand can be stopped and the operation finished with pure water.

How to Remove Air from Wine Bottles.—To keep wine properly, the liquid must actually touch the cork, for any air that is compressed here by corking the bottle is very injurious. Air can be removed by taking a small copper tube about the size of a quill and filing it so as to make a semi-tube, then fixing a thumb ring at the top and sharpening the bottom end. Place the tube in the neck with the flat side against the glass, and the cork is driven in so that the air comes off through the tube. When corked, the tube is withdrawn and no air is left in the bottle.

Photographing Yourself at a Distance.—A curious method of photographing oneself when at quite a distance from the camera is proposed by M. Morisot. Take a wood spring clothespin and shape out one end so that it grasps the bulb of the shutter and the spring tends to press on the bulb. Then the other ends are brought together so as to release the bulb, and are tied with string or thread. On this is put a piece of fuse of some length. Lighting the fuse, the person goes to the distant point before the camera, and when the string is burned the clothespin presses the bulb and makes the exposure.

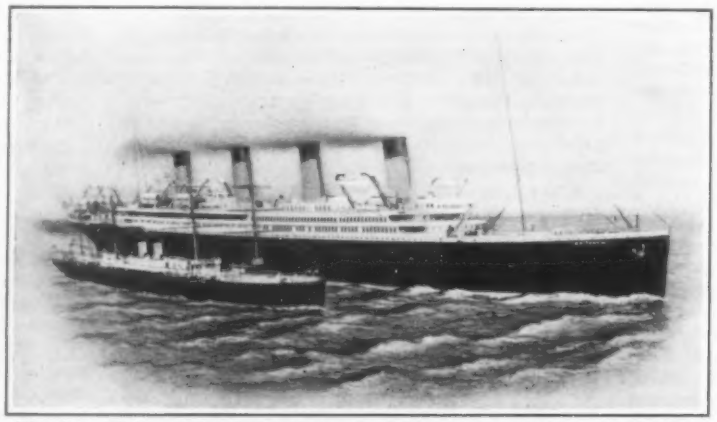
Seeing by Wire.—The sensational paragraphs which have been appearing in the press on seeing by wire are somewhat misleading. There is no indication of anything fundamentally different from the plans which were put forward in the early days of the Physical Society of London, when the late Mr. Shelford Bidwell, Prof. Ayrton, and others, were experimenting with selenium. At that time, mosaics of selenium were going to do all that is promised now, but they never did. It may be that Dr. A. M. Low, whose apparatus has been described in the daily press, has made some progress, but the published accounts of the invention as "the latest scientific discovery" are absurd.

Wireless Telephony.—An article in the Paris *Matin* which has excited much interest refers to some interesting experiments in wireless telephony carried out by Capt. Colin, of the French Navy, who has been at work on the subject for some years in collaboration with Lieut. Jeance. The details of the apparatus are not given, but it would appear that some improvement has been made in the direction of maintaining steady and continuous oscillations at the transmitting end. Speech, it is stated, has been transmitted from Paris to Finisterre, a distance of 300 miles, and a type of field apparatus with a mast about 90 feet high has, it is said, been developed, which can be unloaded from a motor-car and set to work by a crew of six men in twenty-one minutes, and will transmit without difficulty over a distance of from 60 to 120 miles.

Ten Times Greater Than the Old

NEARLY every regular traveler across the Atlantic becomes attached to some favorite steamer on which he voyages frequently, and which he constantly recommends to his friends. The White Star liner first to bear the name "Britannic," launched in 1874 and employed regularly in transatlantic crossings until 1899, was in the fullest sense of the term a favorite vessel, and is remembered pleasantly by scores of thousands. The second steamer to bear this illustrious name is a giant, ten times larger than her predecessor, which is now nearing completion at Belfast.

The birdseye view reproduced herewith is from a photo of actual models of these steamers which our artist has deftly placed in the water, and they demonstrate vividly the rapid strides made during the past four decades in the fine art of ship construction. The newer and greater "Britannic," 50,000 tons, largest of all British steamers, will enter service next spring.



The first "Britannic" (of the 70's) compared with the "Britannic" of 1914. Both ships drawn strictly to scale.

The "America's" Developments of the Past Week

By the Staff Correspondent of the Scientific American at Hammondsport

WHEN Mr. Curtiss had finished testing the open sea-sled bottom attached under the "America," as described in the SCIENTIFIC AMERICAN of last week, he and his associates were pleased and hopeful for better results in succeeding trials. He was now urged by the practical aviators to board up the sides and rear end of the sled-like raft, so as to exclude the water, impart shallow draft, and cause the craft to skim promptly over the water's surface, without having first to be raised from her former deep wallow.

The new bottom measured, in ground plan, 13 feet long by 7 feet wide, was well turned up in front, to mount the water readily, and was hollowed under the fore part, but nearly flat at the rear part, which terminated flush with the step of the hull. Looked at hurriedly, this arrangement seemed good to the uncalculating; there was ample buoyancy and a fine planing surface. The practical fliers who had urged Mr. Curtiss to this form of the sea-sled expected the craft to mount the water and plane better than anything yet tried. But as the center of gravity was at the rear of this huge 500-pound barge, while the center of buoyancy was nearly two yards farther forward, the bow rose and the tail sank. The full thrust of the propellers could neither level the craft nor beget speed enough to make her mount. A submerged planing fin was fixed at a large angle under the stern, but without avail. She would neither lift her tail from the water nor mount and skim. Mr. Curtiss, who at no time had relished this ponderous and costly addition, brought the airboat ashore and held a brief conference with his aviator and constructors.

After considering the many ways that had been tried, and might still be tried, to make the twin motors and attached propellers lift the desired 5,000 pounds to the water surface, so that the boat might plane swiftly on her bottom and rise into the air, it was decided to forego for the present trying further novel devices. Curtiss proposed to add a third 90 horse-power motor, like the others, with a direct connected propeller, and to add beside the bow the early planing fins which had proved so efficient shortly after the "America's" launching. With these fins and two engines nearly 4,400 pounds total weight had been lifted, and carried in successful flight. It was thought that the third engine might add 1,500 pounds lift, 1,000 pounds of which could be available for carrying gasoline.

After discussing the various possible locations for the third motor and propeller, Curtiss decided to mount them on top of the upper plane, near its center of lift, the propeller to jut forward of the leading edge and send its stream back parallel to those of the twin propellers without damage to the original arrangement of propellers and control surfaces. He would take chances on the disturbing effect of such a high thrust. If the craft should rise and fly with an extra thousand pounds of fuel, the third motor might be allowed to work during the early part of the voyage, and later be held in reserve. Possibly ways could be devised to diminish or eliminate the resistance of the idle propeller. These improvements were ordered on Saturday night, with the hope of a trial on the following Tuesday, July 21.

On July 23rd the "America" rose from the water and actually flew, with the assistance of the third motor which had been fitted in place. No long flight was attempted, as the object of this latest trial was to get her to lift from the water with her full load, which has been the result sought for in the long series of experiments made with the craft since she was launched. If it is found on further trial that the "America" can fly with two of her motors working, after rising from the water, she will be considered perfect, and ready for her great effort.

In this latest trial the total load lifted was 6,203 pounds, which is considerably in excess of what she will be expected to carry on her long flight, and provides a margin for additional fuel for the third motor.

Including its third engine and hydroplaning surfaces the "America" weighs 3,500 pounds, and on her transatlantic flight her cargo is estimated as follows: Lieut. Porte, 168 pounds; Mechanician Hallet, 145 pounds; gasoline, 1,800 pounds; engine oil, 176 pounds; food and instruments, 100 pounds; a total of 2,389 pounds.

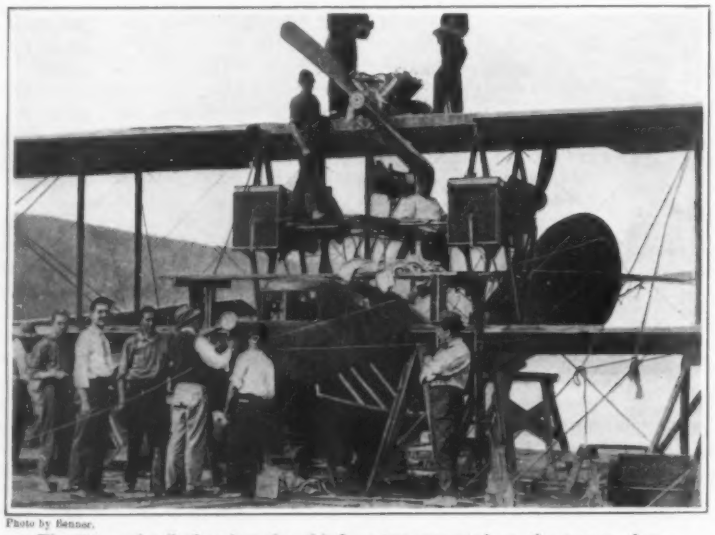
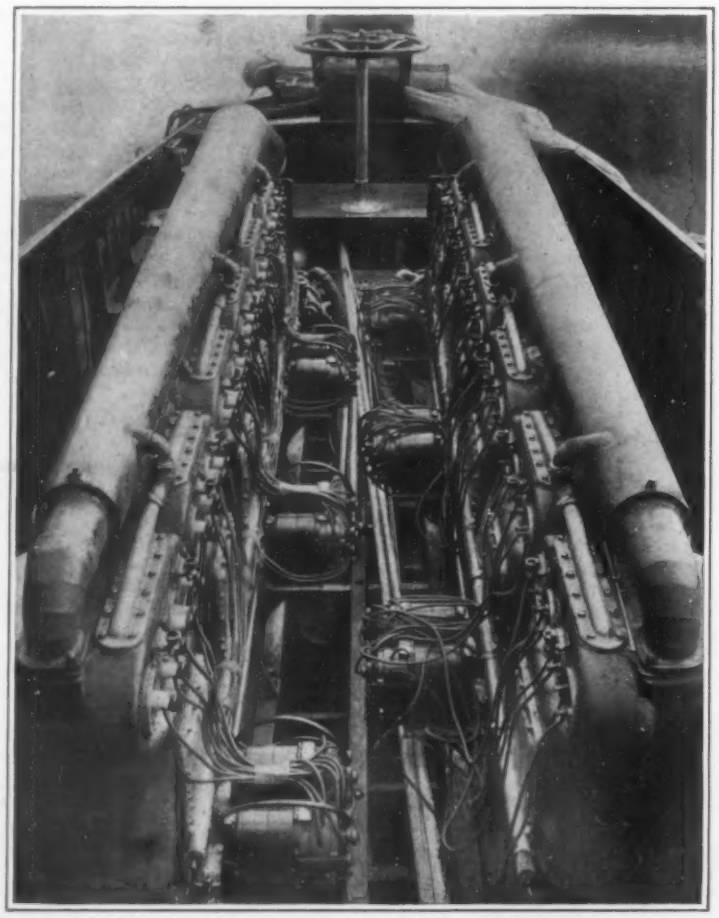


Photo by Benner.

The "America," showing the third motor mounted on the upper plane.



The 1,800 horse-power engine of the "Disturber IV."

Cottonseed Meal as a Substitute for Meat

THE increasingly high price of meat is stimulating the search for other foods supplying the protein that is obtained from meat in the ordinary diet. Experiments recently carried out in Texas by J. B. Rather point to cottonseed meal as a promising food in this connection. This cheap substance is extremely rich in protein. Mr. Rather finds that a pound of digestible protein is twenty-one times as expensive in eggs and fifteen times as expensive in meat as it is in cottonseed meal. Numerous experiments in the use of this food were made on human subjects. It was found that the meal could not be used alone, but, in order to be palatable, had to be mixed with corn meal or wheat flour, the cottonseed meal forming not more than one fifth of the mixture. In this form it was made into bread, muffins, cake, etc., by the ordinary recipes. In the dietary, however, it does not occupy the place of bread or cake, but of meat, which should be partly or wholly dispensed with when the cottonseed meal is used. Diluted as above described, few people will be able to eat more than two ounces of cottonseed meal daily. In addition to protein, cottonseed meal contains nearly as much digestible fat and carbohydrates as beef flank, and more than beef loin or leg of mutton. Whether the long-continued use of this food, to the complete exclusion of meat, would be healthful is, for the present, doubtful, in view of the well-known and still mysterious toxic effect of cottonseed meal when used in large amounts and for a long period in feeding stock.

America's 1,800 Horse-power Motorboat

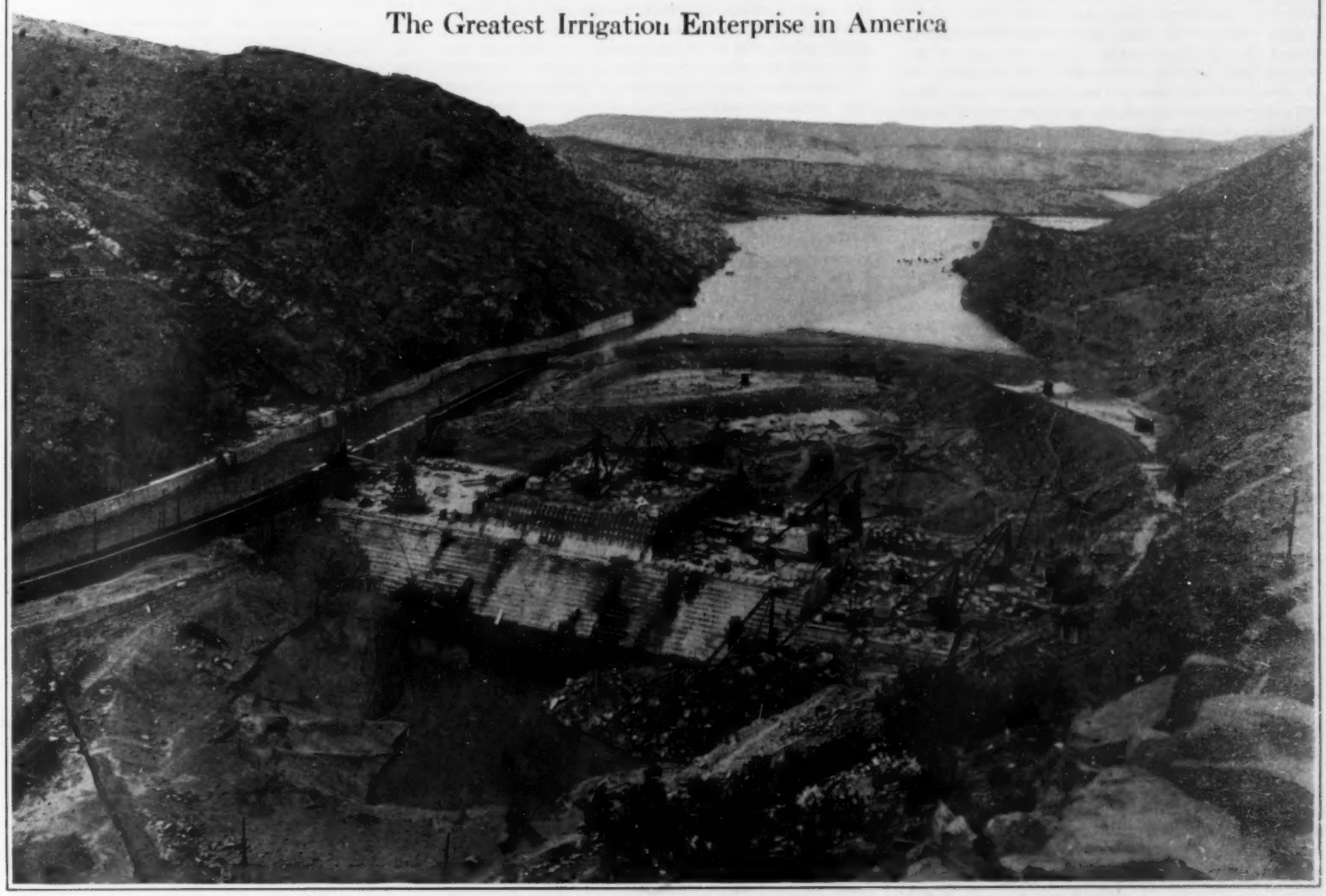
THE only American entry in the international motorboat races for the Harmsworth trophy, which are to be held in England this month, is the "Disturber IV." It ought to make a very good showing, for it is the highest powered racing boat that has ever taken the water.

The "Disturber IV" was built for Commodore Pugh of Chicago. It is 39 feet 11 inches long, and is fitted with two special engines, one at each side of the boat. Each engine has twelve cylinders of 6¾-inch bore by 7½-inch stroke, and has a rated capacity of 900 horse-power, that is, a total of 1,800 horse-power in the whole power plant. Overhead valves are used, the exhaust pipes running over the tops of the cylinders, as shown in the photograph.

The ignition system is the most complex that has ever been placed on an internal combustion engine. There are twelve 4-cylinder magnetos, each supplying two sparks at a time, providing altogether ninety-six spark plugs. At the time this photograph was taken the wiring presented a rather tangled appearance as the work on it had not yet been completed.

The Elephant Butte Dam

The Greatest Irrigation Enterprise in America



Length, 1,200 feet. Maximum height, 300 feet. Maximum width at base, 215 feet. Capacity of reservoir, 2,642,292 acre-feet, or 862,000,000,000 gallons.
Elephant Butte Dam. Rio Grande project.

THE Elephant Butte project in Southern New Mexico, eighty miles north of Las Cruces, is rapidly nearing completion, and will begin to store water the coming winter and spring.

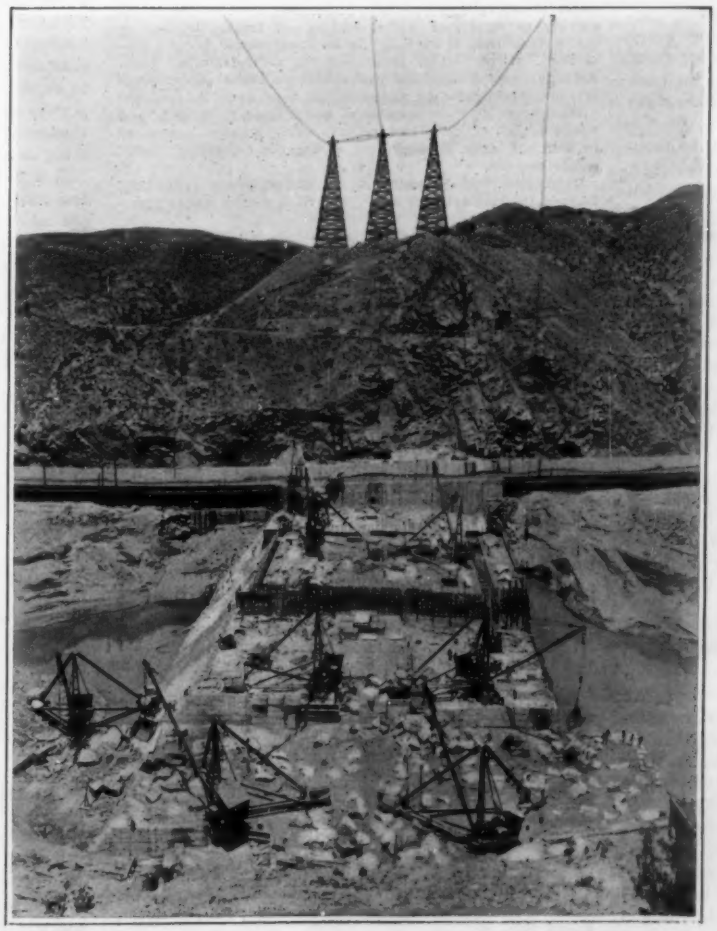
This is the most notable project of the United States Reclamation Service for the reason of its inter-state, international, and engineering features. It will bring into cultivation 180,000 acres of land, 155,000 of which are in Southern New Mexico and Texas.

The completion of the Elephant Butte Dam and the storage of water, which will bring to pass the resurrection of this fertile soil of the Rincon and Mesilla Valleys in New Mexico, one of the only sections, if not the only section, of the United States that rivals the valley of the Nile will be the biggest work of its kind that has ever taken place to further the development of the Southwest and to focus the eyes of our country upon this part of the United States.

These valleys are the oldest irrigated districts in our country. Even before the arrival of the English colonists in the United States, the Spanish explorers were invading this section from Mexico, building missions and founding towns that remain as monuments to their advance and settlement. Besides the ruins of these towns and missions, there remain signs of the agricultural developments that exhibit what had previously been done with the soil of this region. The old vineyards, it is stated, compared favorably with the finest in France and Italy.

It is a striking and fitting coincidence that here in these valleys, after more than four hundred years of irrigation in one form or another, should be found the location of the biggest and finest irrigation project in the entire country.

The particulars of the Elephant Butte Dam, as regards its dimensions, are as follows:



Construction of the Elephant Butte Dam, containing 550,000 cubic yards of masonry.

The length of the dam will be 1,200 feet.

Width of the roadway on top will be 18 feet.

The maximum height of dam will be 300 feet.

Maximum width at base, 215 feet.

It will have twelve water gates.

There will be 550,000 cubic yards of masonry in the structure.

It will create a reservoir 45 miles long, submerging 40,000 acres of land. The artificial lake which will be formed by the dam will be the largest of its kind in the world. The capacity of the reservoir will be 2,642,292 acre-feet of water, an acre-foot being enough water to flood one acre of ground one foot deep. It will contain 862,000,000,000 gallons of water.

This water, if spread out one foot deep, would cover more than 4,128 square miles, or an area of over twice that of the State of Delaware. It would fill a pipe 4 feet in diameter, 1,734,700 miles long, or nearly seventy times around the world. It would fill one hundred canals 20 feet wide and 4 feet deep, stretching from New York to San Francisco.

The maximum depth of water near the dam will be 193 feet, and the average depth of water 66 feet.

In building the dam, it was necessary for the Government to construct 19½ miles of roadway, 21 miles of telephone line, 7½ miles of power line, and 13 miles of railway. The cost of the project will be $7,200,000.

The annual flow of the Rio Grande at the dam is 800,000 acre-feet. The lands comprised in this project will require for their irrigation only 600,000 acre-feet per annum. After figuring in every possible source of expenditure, waste, and depreciation, there will be left in the reservoir

for emergencies, after it has once been filled, not less than 1,400,000 acre-feet, or more than enough water to irrigate the entire acreage during more than two years of total drouth. This latter statement will probably give the most adequate idea of the immensity of the dam and the wonderful storage capacity of water for irrigation which it will provide.

With water in the big Elephant Butte Reservoir, the farmer in the Rincon and Mesilla Valleys of New Mexico will be master of his land. Farming will be changed from "chance" to "certainty"—no drouth can cause loss, for he will have his own water factory. No floods will occur, for he will control the flood gates.

In the neighborhood of 60,000 acres of this land are being irrigated at the present time from community ditches which take their water from the flow of the river. Some very fine crops are being obtained, and they are illustrations of what can be done and suggestions of the greater things that can be expected with water behind the dam.

It is not claimed that these valleys will produce fabulous crops without labor. Here, as elsewhere, the soil will not yield its best returns without proper work and proper cultivation. The claim is made, however, that with proper cultivation the land of these valleys will produce results equal, if not superior, to any to be had from the richest irrigation districts in the world.

Alfalfa is the leading crop at the present time, and from four to five cuttings, and from one to two tons to the cutting are obtained. Wheat yields from 25 to 45 bushels per acre and corn from 60 to 75 bushels. The valleys are ideal for the growing of fruit and truck, and these are the crops that will replace all others in the future years, as this land will ultimately become too valuable for the growing of such crops as alfalfa, corn, and wheat.

Las Cruces is the principal city of the valleys, with a population of 5,000. It is a modern, up-to-date city with all public utilities and churches of all denominations. It has an unusually fine school system, and in addition to the public schools, the Loretto Academy, conducted by the Sisters of Loretto, is located in Las Cruces, and the State Agricultural College, which is a very big asset to the valleys, is located at Mesilla Park, two and one half miles from Las Cruces.

Recently a big and magnificent work was inaugurated by the Elephant Butte Water Users' Association, an association of the farmers, in the forming of a publicity and immigration campaign, not for any financial return, but to give out full and accurate information in regard to the project and the valleys and to help the man who wishes to obtain a location here to get settled, and to help him in every way possible after he becomes a neighbor.

In addition to the help of the Water Users' Association, the United States Reclamation Service, which is building the dam and is now in charge of the construction of the entire project, stands ready to render every possible assistance to the newcomer, and their stamp of approval, from their many years' experience in such matters, is on all this work, the Water Users' Association work included.

In mentioning the Elephant Butte Dam and the thousands of acres to be reclaimed with the water which it will store next spring and the great development which it will bring to the Southwest, perhaps the greatest charm of this section after all, lies in its climate. The average elevation is about 4,000 feet. There are 325 recorded days of sunshine out of the 365. The temperature does not go below zero, and averages in the neighborhood of 78 during the spring, summer, and fall. The purity of the air and the almost perpetual sunshine make it the ideal climate for the invalid from lung trouble. It has been pronounced by a body of medical experts from Europe who visited all sections of the globe and reported to the French Medical Congress that the valleys in New Mexico (now coming under the Elephant Butte Dam) were as nearly ideal as an all-year-round climate as could be found in the world.

So, after hundreds of years of crude irrigation by the ancient Pueblos, the early Mission Fathers, and early Americans, and having been for many years entirely forgotten, these valleys once more will break into beauty and bloom.

Trucking a Radio-telegraphic Outfit

IN a recent march from Fort Myer, Va., into Pennsylvania, the Third Field Artillery, U. S. A., had as part of its equipment a truck in which was mounted a radio-telegraphic outfit, the success of the wireless experiment being well explained in a message sent by the set from the commander, Major Charles P. Summerall, to the chief signal officer, wherein it is said: "Radio tractor has completed tests in every particular perfectly during march of 260 miles; no damage or delay occurred to tractor or equipment. Command always in communication with Arlington or New York after latter was called. It completely fulfills all requirements as means for maintaining communication over theater of operation and with distant stations.

The Anthony N. Brady Memorial Medals

THE family of the late Anthony N. Brady has authorized the award annually by the American Museum of Safety of a gold medal to that American electric railway company which for the year of award shall have done most to conserve the safety and health of the public and of its employees. In addition to the gold medal awarded to the company, a replica in silver will be awarded to that member of the operating staff who has most contributed to the successful record of such company; and another replica in bronze will be awarded to that employee of the company whose services have been of the greatest value in the promotion of safety and health.

Conditions of Competition.

The following have been adopted as the conditions of the competition:

The competition shall be for the year ending June 30th, and the award for the first year shall be for the year ending June 30th, 1914.

Every company entering the competition shall file with the American Museum of Safety by the 31st day of August next after the close of the year the data upon which it founds its claim to the award. Such data for the year ending June 30th, 1914, shall be filed by August 31st, 1914.

Every competing company shall include data covering all lines comprising the entire system of which it is a part, wthout regard to technical ownership. The test ordinarily would be operation under the jurisdiction of a single president.

Such data shall include:

1. A report of all casualties to passengers, employees and others.

The terms used in this form are to be understood as follows:

Train miles run shall be the total of all revenue and non-revenue mileage made by motor cars or locomotives in all classes of service, except construction service. The mileage of single car operation is regarded as train mileage.

The number of employees for computing the rate per 1,000 in industrial accidents is determined by dividing the aggregate days worked by all employees in industrial service, such as track men, line men, shop men, power house and substation men, freight handlers, and others not actually engaged in the operation of cars, by the number of working days in the period covered by the report.

Train accidents include all casualties resulting from collisions with other cars or trains, derailments, and miscellaneous accidents to trains.

Other than train accidents include all casualties resulting from accidents to roadway or bridges not causing derailments, as, for instance, fires, floods, land-slides, explosions, etc.; also all resulting from collisions with vehicles, platform accidents, and other accidents connected with the actual operation of cars not including industrial accidents.

Industrial accidents include all accidents not involving train operation, but occurring to employees of the company on or about railway premises. Instances are: accidents occurring to employees while working on tracks, bridges or other structures, at stations, in or about power houses, substations, shops, barns, transmission and distribution lines. Railway premises include highways and other public property occupied under franchise rights.

Passengers include passengers on passenger, freight, and mixed trains or cars, and persons carried under agreement or contract, such as employees of express companies, postal employees, etc.

Employees include employees of the company competing, but not the employees of other companies carried under agreement or contract.

Other persons not trespassing include all persons other than passengers, employees, and trespassers.

Killed: Accidents to persons resulting in immediate death or in death within 24 hours from the time the accident occurred should be reported in columns headed "Killed."

Injured: All other accidents to persons, including those resulting in death of the person injured after interval of more than 24 hours from the time the accident occurred, should be reported in the column headed "Injured." Trivial accidents need not be reported. Accidents to employees shall be regarded as trivial if they result in injuries so slight as not to prevent the employee injured from performing his accustomed service for more than three days, in the aggregate, during the ten days immediately following the accident. Injuries to passengers and other persons that do not prevent the injured person from following his customary vocation for more than one day shall be regarded as trivial.

2. A report of the various measures taken during the year to conserve safety and health, including, among others, the following:

a. Block signals.
b. Protective devices at railroad crossings.
c. Protective devices at highway crossings.
d. Protective devices at other points of danger.
e. Automatic stops.
f. Safety devices in cars, shops, power houses, sub-stations, and in connection with roadway and transmission and distribution systems.
g. The separation of grades, the reduction of curves, and the elimination of obstructions to view.
h. The observance of high standards with regard to the inspection, maintenance and improvement of rolling stock, roadway transmission and distribution systems.
i. Standards of employment, physical, and mental.
j. Periodical examination of employees, physical and mental.
k. Rules and discipline.
l. Educational measures affecting the public, including school children.
m. Educational, protective and co-operative measures by and through employees.

Measures to Alleviate Effects of Accidents.

a. First aid to the injured, including instruction and training of employees, and first aid equipment.
b. Emergency and other hospitals.

Measures to Promote Health.

a. Attention to lighting, ventilation, cleanliness, disinfection, pure water, sanitary conveniences, and other factors affecting the health of passengers.
b. Attention to lighting, ventilation, cleanliness, disinfection, pure water, sanitary conveniences, and other factors affecting the health and welfare of employees.
c. Instruction of employees in matters of hygiene and sanitation.

3. A report showing the following facts in connection with the operations of the company for the year:

a. The single track mileage of all lines operated during the year.
b. The division of the track mileage into surface, elevated and subway lines respectively; also into urban, suburban, and interurban lines, respectively; showing also what part of the mileage is on the private right of way.
c. The number of revenue passengers carried, showing separately the number carried on surface lines.
d. The number of car miles run, showing separately the car miles run on surface lines.
e. The gross earnings per mile of single track in each class of service.
f. The amounts of earnings, both the amount set aside and that actually paid, on account of accidents occurring during the year, together with the ratio of such amounts to gross earnings.
g. The monthly average number of employees.
h. The especial difficulties, if any, physical, legal and other, affecting the safety of operation.

4. A report of all other facts regarded by the company as materially bearing upon the record for conservation of safety and health made during the year. Data for other years may be given under this heading.

The committee on award may ask for any additional data.

Heart Strain and Its Prevention

IN reading a paper recently on "Heart-Strain and its Prevention" before the Institute of Hygiene, Dr. J. Strickland Goodall drew attention to the enormous amount of work done by the heart. From before birth until, usually, a short time after death it beats uninterruptedly at rates varying from 70 to 150 or more contractions a minute, doing at each contraction enough work to raise a 2-pound weight through a foot. Some conception of the work done can be gaged by placing a 2-pound weight in the palm of the hand, resting the elbow, and raising and lowering the weight from the level of the elbow to the shoulder.

Acute heart-strain is difficult to produce in a young, well nourished, and healthy adult; but it is very easy to produce if the heart-muscle is anæmic, poisoned, or the seat of degenerative change. When the heart is strained, it loses its power of doing extra work. Cases have been observed in which the heart had actually burst, and one case in which an animal had ruptured its heart and died from emotion. Heart-strain may be induced in some of the common, thoughtless actions of everyday life, as, for instance, in the action of running to catch a train. In an actual experiment made on a person with a healthy heart, before the run the heart-rate was 76 per minute, and the heart was doing 152 foot-pounds of work a minute; after the run the heart rate was 180 per minute and the heart was doing 360 foot-pounds a minute—an increase of 228 foot-pounds per minute. Great strain may also be imposed upon the heart by ascending stairs hurriedly.

Emotions affect the heart, and as a result of anger the work of the heart may be increased from 152 to 224 foot-pounds per minute. "Keep your temper" is, therefore, good physiological advice. When the cardiac rate and work are increased by strenuous exertions, it is not only during the actual exertion that the heart's work is increased, but extra work continues to be done for some time after the cessation of the exertion. The enormous amount of total extra work done by the heart is shown in the experiment of riding a bicycle uphill, the gradient being 1 in 10, the length 2,904 feet, and the time of the ride 3½ minutes. In a tested example the extra work would have raised 1⅛ tons through 1 foot.

The work of the heart could be economized in many ways. If one went to bed every night at 10 instead of 12, the heart would be saved 876,000 foot-pounds of work in a year; by lying down half an hour daily there would be an annual economy of 219,000 foot-pounds; an hour's rest every Sunday would save 62,400 foot-pounds; and by spending every Sunday in bed, instead of only sleeping eight hours, the saving in the year would be 998,400 foot-pounds.

Thermometers in Railroading.—The Lehigh Valley Railroad has just installed accurate thermometers, properly exposed in louvred wooden screens, at the principal railway stations throughout its system. The plan of maintaining such instruments enables a railway to telegraph at any time to any part of the line and find out whether the temperature is suitable for moving certain classes of freight which are liable to injury by heat or cold.

Correspondence

[The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.]

Animals That Never Drink

To the Editor of the SCIENTIFIC AMERICAN:

Your note on page 497 in issue of June 20th, entitled "Animals That Never Drink," recalls my boyhood days when I lived on a farm in southern Michigan, in Lenawee County, near the Ohio line, with my father, who was a successful raiser of sheep. A flock of sheep would be confined in a pasture of 6 or 8 acres during the summer until the grass was eaten short, and then changed to another field for a few weeks at a time.

I noticed that the sheep had no access to water, no stream or spring or pond nor depression where water could accumulate in time of rain, and no water was supplied to them at any time, yet the sheep were fat and apparently in good condition.

I once called my father's attention to the absence of water and asked how the sheep could live without it. He replied that they obtained sufficient water by grazing in the early morning hours when there was usually a heavy dew on the grass. The grass was often very wet with dew, as I had seen, and this, I believe, furnished sufficient moisture for the needs of the sheep.

Might not this explanation apply also to the case of the antelopes and the gazelles mentioned by Drs. Blanford and Drake-Brockman? J. H. DARLING.

London, England.

Some German Pioneers in Technical Education

To the Editor of the SCIENTIFIC AMERICAN:

I knew you will be fair and just to the many staunch friends of the SCIENTIFIC AMERICAN through taking notice of my suggestion that the late esteemed professors at Carlsruhe (Germany) deserve credit for giving to their students in lectures and experiments at once any new advances in applied sciences.

My sincere thanks for it. For instance: Prof. Eisenlohr gave in 1854, by experimental demonstrations, the "wave theory" of sound and light better than I saw it since sixty years. Prof. Redtenbacher was the first one to teach "construction" in mechanical engineering on a system based on theoretical plus practical investigations.

Thumb rule of millwrights to produce mechanical contrivances ended forever with Redtenbacher's "system" of construction. My late friend, Prof. Reuleaux of Berlin, the Sulzer brothers of Winterthur, Switzerland (my fellow student), Belgian, Austrian, and German engineers laid the foundation for future great achievements under Eisenlohr and Redtenbacher at Carlsruhe. I am close on 80 years, and felt during my long professional career the benefits of teachings by such able and esteemed men who understood to give lasting foundations in the minds of their students.

Little Rock, Ark. ROBERT KUNSTMAN, M.W.S.E.

The Fallacy of Eternal Youth

To the Editor of the SCIENTIFIC AMERICAN:

A quarter century has passed since Brown Sequard launched a goat's lymph theory of everlasting life. So it is with those who have moistened their lips by a new sensation, after the inconveniences, and pains and aches of age set in; then, these scientists look about for a "Fountain of Youth," or becoming reconciled to the inevitable, he seeks by a fair or foul means some sort of intercourse with the nether world.

There are topics beyond human understanding, and many theories must be taken upon faith. We cannot explain why and how we entered upon the units of this world we live in, and we cannot explain where and how we are leaving it, save by faith, and the belief in the teachings of those best qualified to advance satisfactory dogmas. Have any of these comprehended fathomless space? Our five senses carry to the brain a few mathematical facts of scientific research, yet we continue to seek, until we must eventually round up at a standstill. In a limited world, there is a limited investigation. The lower animals live their lives, guided by instinct. Man, only recently is beginning to know what the birds have known of the air since time immemorial. The study of air rivers, air eddies, calms, storms, electric, etc., is being worked out by aviators. Why not employ more instinct and less scientific investigation, where the seeming impossible is to be surmounted? The conscience of man is an instinct. The conscience rules the higher ego, the appetites the baser ego. Those who have studied conscience, believe that the simplest life we can lead proves the happiest, which goes to show that pseudo ambition is harmful. Napoleons die young, but observe the denizen of a Sahara, in his life long quiet way of getting close to nature—is he not sure of his four score and ten?

It is plausible to prolong the life of a cell by bathing it in its life-giving pabula, or by supplying a new cell element at its molecular death. It is possible to preserve a building by substituting a brick, a stone, a door, or a window for the disintegrated unit, but! what an exhausting, troublesome method, when the old structure can so easily be demolished in its entirety, and a new and beautiful one reared in its place. Man's life is continued by his progeny, until it is ordained, that man can no longer inhabit this sphere of the universe. With each geological era, a new creature held sway, and then quietly passed into oblivion. Therefore, there is no logic in assuming that the creature, man, has arrived to stay.

To offer the public any such fallacy as indefinite existence, to disappoint an already hysterical "idle rich," is as wicked as to promise to a "deserving poor," immunity from tuberculosis, or for that matter, any rapacious disease decimating their ranks.

J. A. GUTHRIE.

Portsmouth, Va.

More Technical Writings by Untechnical Men

To the Editor of the SCIENTIFIC AMERICAN:

The letter from Mr. Charles S. Rindfoos in your July 11th issue on the technical writings of untechnical men inspires me to record a few recent slips of the newspaper writers in dealing with the automobile. Automobiles are fairly familiar articles, both on the streets and in the papers, yet observe this display of ignorance in one of the New York papers. The account has to do with a street accident, and the reporter concludes his remarks by writing: "The chauffeur opened his exhaust valves, and the cloud of steam which belched forth obscured the number plate." Either this car was a steamer with hand-operated exhaust valves (!) or the reporter didn't mean exactly what he said.

The *Sun* not long since told of a beginner who became confused and ran up on the sidewalk, injuring three people. The car would have done further damage, the *Sun* tells us, but for the presence of mind of the demonstrator sitting beside the beginner, who "pulled the clutch lever, bringing the car to a halt." Obviously a new type of control mechanism on this car, with hand-operated clutch having marked braking powers.

The following was printed in the *Mail* a week or two ago: "Several persons living nearby said they heard a loud report shortly after 8 o'clock, but all thought it a cylinder explosion on an automobile." Of course, the reporter meant that they all heard a muffler shot, but why an "explosion *on* an automolie."

The most perfect contribution to technical literature of all, however, has been reprinted in the English *Motor* from the Plymouth *Sports-Herald*, as follows: "Through a fly getting into the carbureter and turning the sparks in the wrong direction a large motorvan caught fire last evening. . . . All the bottom part of the car was damaged, and the wires and the magneto were burnt." The *Motor's* sole comment is, "What happened to the daring fly?" ALFRED F. LOOMIS.

Huntington, N. Y.

Instinct or Reason?

To the Editor of the SCIENTIFIC AMERICAN:

In looking over some back numbers of the SCIENTIFIC AMERICAN I noticed in your correspondence column a letter regarding animal instinct. It reminded me of a performance to which I was witness at Winona Lake, Indiana, in 1909. Birds are made welcome there, so the woods are full of members of the feathery tribe.

One day I saw a pileated woodpecker, or flicker, working away in a very peculiar manner. He pecked or nibbled at something on the ground and then drew his beak down the lower border of his wing. Again he pecked, and drew the lower border of his other wing through his beak. He kept up this performance, alternating the nibbling and stroking of first one wing and then the other, for five or ten minutes at a time. I was very much puzzled, and on investigation found that he was working at an ant hill, and I was still more puzzled.

Later I saw purple grackles going through the same maneuvers, with ecstatic eagerness at an ant hill. And then one day the secret was revealed, as I watched one of the iridescent gentlemen with a piece of orange peeling. I was not more than fifteen feet away from him, and I could see perfectly what he was doing, *and he was not eating the orange peeling!* He was nibbling and squeezing it in his beak, and stroking his wing feathers. All he lacked was a mirror! It took him some time to prepare for the reception to which he had evidently been invited, and so I had a good opportunity to observe his toilet preparations.

The secret of the strange operations at the ant hill, of both himself and his speckled brother, the flicker, stood revealed. There they used formic acid instead of oil of orange peeling.

I had never been a witness to such performances on the part of birds before, neither had I ever seen anything similar recorded, even though I have always been an interested reader of everything I could find of bird and animal life.

Perhaps some of your readers may have seen birds using perfumes. I wonder if the fashion started at Winona Lake, Indiana? (DR.) EMMA T. MILLER.

San Antonio, Texas.

The Case of the "Siberia's" Wireless Message

To the Editor of the SCIENTIFIC AMERICAN:

Your correspondent, Mr. Philip E. Eddleman, in commenting upon the reported accident of the steamer "Siberia," has evidently failed to recognize the most probable cause for the confusion of the signals as given out in the press.

To date there has appeared no explanation of the reports on the part of the operators concerned, themselves, and it appears a little premature to so severely censure the men who were in charge of the radio equipment on these ships without having some knowledge of the facts of the case.

It is well known to those versed in the art of radiotelegraphy, that there are times when the accurate reception of messages is exceedingly difficult, and in some cases entirely impossible. The writer has been intimately associated with the radio service, commercially and scientifically, for a period of ten years, and can recall numerous cases to support this statement, as can any operator. As an example, on one occasion when the cable connecting Mackinac Island with St. Ignace was broken down, an important message regarding an escaping criminal was handled between the wireless station on the island and the station at Sault Ste. Marie. This message was not a long one, and ordinarily should have required no more than two minutes for transmission, but, owing to necessary repetitions and re-repetitions, something over two hours was required to get it through correctly. This was due to the severe atmospheric conditions, known as "static," that were prevalent at the time.

Aside from static, which is the most common cause for delays or mistakes in messages, there are numerous other things that may make the reception difficult, among which may be mentioned induction or leakage from power or lighting circuits, interference from other stations, or loud, nearby noises such as fog signals, band music, etc., any or all of which may be found on a ship or near a land station.

Another wholly different cause for errors can be charged to the sending operator. Some men who are considered good operators, both wire and wireless, have the habit of running certain letters together, making so-called "combinations." As an example, the writer knows of one experienced operator who invariably makes the letters W M E (.—— ——— .) as W G (.—— ——.). Such combinations are very apt to be wrongly interpreted, especially when they occur in code words, or in call letters with which the receiving operator is unfamiliar.

Now, returning to the case of the "Siberia," the call letters M B S repeated three times, followed by the letters of the calling ship repeated three times, in accordance with the international regulations, if sent by an operator who was accustomed to making "combinations," might easily be mistaken for the S O S distress signal by wrongly combining the different characters. The letters M B S, in Continental Morse, repeated three times, are as follows:

M	B	S	M	B	S	M	B	S
—	–...	...	—	–...	...	—	–...	...

Now if these letters are run together, without proper spacing between the dots and dashes of the letters and between the words, we obtain the following,

— -... (... — -...)(... —-...) ...

and the characters enclosed in the parentheses are the exact formations used in the distress signal.

Immediately following this call, it is reported that the calling ship sent out her position, which is exactly the things that would first be sent out after a ship had sent out the S O S signal. It is not so strange, after all, how an operator, hearing the above and possibly nothing else, might notify his captain that a ship was in distress. If the operator had overheard the above and, being uncertain as to just what the signals meant, and not notified the captain, he might then be criticised.

M. E. PACKMAN,
Department of Radio Telegraphy,
Dodge's Institute of Telegraphy.

Valparaiso, Ind.

A Meteorological Library in New York City.—The New York Public Library has just acquired the extensive collection of meteorological works formerly kept at the Central Park Observatory. These consist chiefly of the year-books and other periodical statistical publications of foreign meteorological services and observatories; a class of literature which is found in very few libraries in this country. The largest collection of such works is that in the library of the Weather Bureau, in Washington.

Air Pressure in the Subway

By Frederic Campbell, Sc.D.

ALL who ride in the New York city subways have experienced a strange discomfort in the ear at various times, not always the same, and most pronounced in passing into and through one of the tubes leading under the river. This is due to the compression of the atmosphere produced by the train's motion; and it is felt most in the tubes because they are more confined, there being insufficient outlet for the air's escape. It is said that in the tubes of the Pennsylvania Railroad, passengers manifest particular sensitiveness, as indicated by unusual effort at swallowing; to this they are prompted because of the Eustachian tube, connecting the throat with the inner ear; it is an effort to equalize the pressure on both sides of the eardrum.

The aneroid barometer, so sensitive that it will often move its needle when even carried from the first to the second story, is well fitted to record and measure the variations of air pressure on moving trains in subways; and the writer recently made the experiment with a Tycos instrument. It is easy to believe that, if he had stood at the very front of the train, with the door closed behind him, so that no air could escape through the car, he would have found the needle indicating greatly increased pressure, that is, showing a higher record, as if one had descended to lower levels, where the air is always more dense. And, if he had stood at the extreme rear of the train, with the door closed behind him, so that no air could sweep upon his instrument from the interior of the cars, a much lower record would have been read, as if one had ascended to some lofty hilltop, where the air strata are more rarefied. Directly in front of every swiftly moving train, particularly if confined in a tube of small caliber, the air is being forcibly packed into a condition of great density; while directly behind it, the recession of the train is leaving the air behind, causing a partial vacuum.

But, these facilities not being granted to passengers, experiments can only be carried on within the cars; these, being open at ventilators or windows, afford good opportunities, as one's sense of discomfort in the cars may well assure us. The experiments in going were made in the front car, and in returning in the rear car. The trip going was from Borough Hall, Brooklyn, over the Broadway line to its terminus at 242nd Street. The trip returning was from 177th Street of the Bronx line back to Borough Hall, Brooklyn. As the barometer was found to stand exactly the same at Borough Hall on the return as at the start, it is apparent that weather conditions had not materially changed. The following table shows the readings, as recorded in the inches of the mercurial barometer column; the first column should be read down; the second column should be read up; this arrangement enables one readily to make comparisons.

	Front of first car, Broadway line, going.	Rear of last car, Bronx line, returning.
Borough Hall	29.84	29.84
Entering tube	29.90	29.88
Highest tube pressure	30.05	29.90
Lowest tube pressure	.....	29.84
Bottom of tube	.....	29.87
Bowling Green	29.90	29.88
Wall Street	29.87	.....
Between Brooklyn Bridge and Fourteenth Street	29.84-29.89	.....
Fourteenth Street	29.86	29.85
Between Fourteenth Street and Grand Central	29.84-29.87	.....
Grand Central	29.84	29.83
Between Grand Central and Seventy-second Street	29.80-29.86	.....
125th Street	.....	29.85
Between 149th Street and 135th Street	.....	29.82-29.87
Third Avenue and 149th Street (subway begins)	.....	29.84
177th Street, elevated platform, open-air	.....	29.78
242nd Street, elevated platform, open-air	29.82	.....
242nd Street, street level, open-air	29.84	.....

From the above figures the reader may draw his own conclusions. Looking them over, however, it is manifest that, within the train, there is not the difference in pressure that the ear discomfort seems to indicate. The very highest figures here given are 30.05, and the lowest 29.78, a difference of only 0.27 of an inch on the mercury scale. Every subway traveler knows how quickly the ear discomfort is relieved, even while still closely confined in the tube. It is conceivable, however, that, with the swift rush of the train, barometers in different cars and even in different parts of the same car would read differently at the same instant; with the whirl of the atmosphere, there may easily be dense spots, and also rare spots or "pockets;" and the action of the aneroid barometer is not sufficiently prompt in its response to rapidly changing conditions.

Enough is shown, however, to support the theory that there is condensation at the front and rarefaction at the rear of a subway train, and that this is particularly marked in the close limits of the river tube. The highest pressure was shown in the front car going, while in the tube; and, in the rare car, returning in the same conditions, the instrument recorded 0.21 of an inch less pressure. From this it would seem that relief from ear discomfort might well be expected at the rear of the train, and that this relief may be expected in increasing degree as one selects his seat farther from the train front.

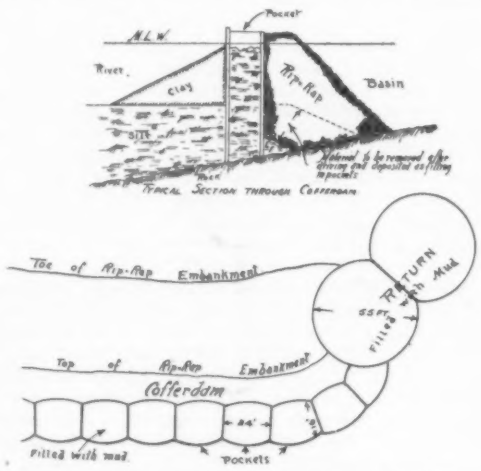
The high reading at bottom of tube is partly due to the low altitude; for there we are below sea level, and not a few feet beneath that of Borough Hall and the subway generally. Some other variations of reading are doubtless also due to variation of level rather than to differences of air pressure caused by the motion of the train. Where two or four tracks spread out across the subway, there is such opportunity for the air to escape that the barometer is not commonly affected; yet in the rush and whirl of swiftly passing trains it sometimes shows considerable uneasiness.

The Great Cofferdam for the Hudson River Piers

By Robert G. Skerrett

A VERY notable engineering task is under way on the Hudson River side of New York city preliminary to the building of the 1,050-foot docks for the biggest of ocean liners. The first of the new piers are to be located at the western ends of Forty-fourth and Forty-sixth streets, so as to facilitate the ease with which passengers may go to or from the center of the city with its hotels and railroad terminals.

As the Commissioner of Docks and Ferries, Mr. R. A. C. Smith has pardonably declared: "The construction



Cross-section and plan of the North River cofferdam.

of these piers involves unique engineering problems of very great interest. The site selected is located over a shelving rock ledge 20 feet below mean low water at the inshore end and from 44 to 50 feet below mean low water at a point approximately 220 feet from the present shore line. In order to remove this subaqueous rock it is necessary to uncover it by holding back the waters of the Hudson River by means of a temporary dam and by blasting out the stone when thus exposed. This method in the end will prove considerably cheaper than by the under-water blasting of the rock because it insures a more satisfactory consummation of the task. It is essential for the safety of the ships which are to use the piers that the rock be removed to a uniform depth, and that no jagged points be allowed to remain to menace the hulls of those vessels. This uniformity could be made certain of at a minimum of cost by working upon the rock only when uncovered. Besides, by dry excavation, it is possible to leave solid buttresses of rock to support the pier structures, and thus to provide smooth and uniform walls from the river bed upward."

To carry out the preliminary steps of this unusually large project, the engineers of the Department of Docks had to plan without any comparable precedent to guide them. True, the Federal authorities had done kindred work in the cases of the cofferdams at Black Rock in the Niagara River, and in uncovering the bed of Havana harbor preliminary to the raising of the ill-fated battleship "Maine"; but the task on the shores of the Hudson is a much more difficult one in certain particulars. The cofferdam when finished will have an approximate length of 800 feet, and with a depth of water of 38 feet, plus silt 30 feet deep overlying the ledge, the experts have had to provide against a combined hydrostatic pressure of a head of 68 feet. Therefore, even with the use of modern steel sheet piling, the stability of the bulkhead had to be assured by flanking support. Accordingly, there will be a bank of rip-rap on the inshore side having a width at the base of something like 70 feet, and rising to a point 6 feet above mean low water. The offshore side of the dam is being steadied by a clay embankment of suitable dimensions.

Between the dam and the shore there is now impounded a body of water amounting to quite 55,000,000 gallons, and the drainage of this will leave the structure to bear unaided the one-sided thrust of the Hudson. The area left dry will be 800 feet long with an average of 300 feet in width, and out of this pocket there will have to be excavated 76,500 cubic yards of solid rock to make the necessary channels for the slips for the first pier and a half. The half pier will be lengthened as occasion requires, and other piers will be developed later. But when the immediate project is completed, there will be a depth of available water at low tide of 44 feet, and room enough to accommodate three of the largest of the transatlantic liners.

The walls of the cofferdam are made up of Lackawanna steel sheet pilings having a width of a trifle over 12 inches between interlocks, and about 70 feet long. The pilings are driven so as to form a series of contiguous pockets with an average length of 24 feet and a breadth of 16 feet, the front and rear faces being slightly arched, and the connecting walls perpendicular to the flow of the stream. The pockets have been filled with the mud dug from the inner face of the cofferdam, preliminary to building the rip-rap up from the bed rock. The pile drivers have encountered a number of difficulties in the neighborhood of some of the old wooden piers, and at times it has taken 170 blows to get the piling home to rock bottom. Otherwise, the work has gone along in a satisfactory manner. The true test will come some months later when the basin is drained. By way of guarding against any show of weakness at that time, the face of the cofferdam has been provided with a couple of good-sized sluices, and it will be possible through them to reflood the area quickly. Again, these same sluices will facilitate letting the water in when the excavating is finished—a necessary advance operation before starting the demolition of the dam.

The cost of building the cofferdam and excavating the rock, as per contract, is to be $487,812.90. As high as $708,128.52 was bid, and the city's engineers figured the work could surely be done for $497,500. This was certainly coming pretty close to the possibilities of the contractor, and it is a very creditable performance on the part of the officials of the department concerned.

The Largest Fore-and-Aft Sailing Yacht

THE spirited picture on our front cover of this issue represents the largest fore-and-aft, three-masted sailing yacht in existence. It was designed by William Gardner, and is now nearing completion at Lawley's yard for Alexander S. Cochrane, the owner of the cup defending yacht "Vanitie."

Several notable three-masted fore-and-aft schooners have been built in this country during the past few years, which are thoroughly familiar to that portion of the public which takes a keen interest in yachting. The first of these was the "Atlantic," which, it will be remembered, won the transatlantic race for a cup offered by the German emperor. The second was the "Karina," designed by Theodore B. Wells for Robert E. Tod, and the latest and largest is the yacht which is herewith illustrated. The principal dimensions of these three vessels are as follows:

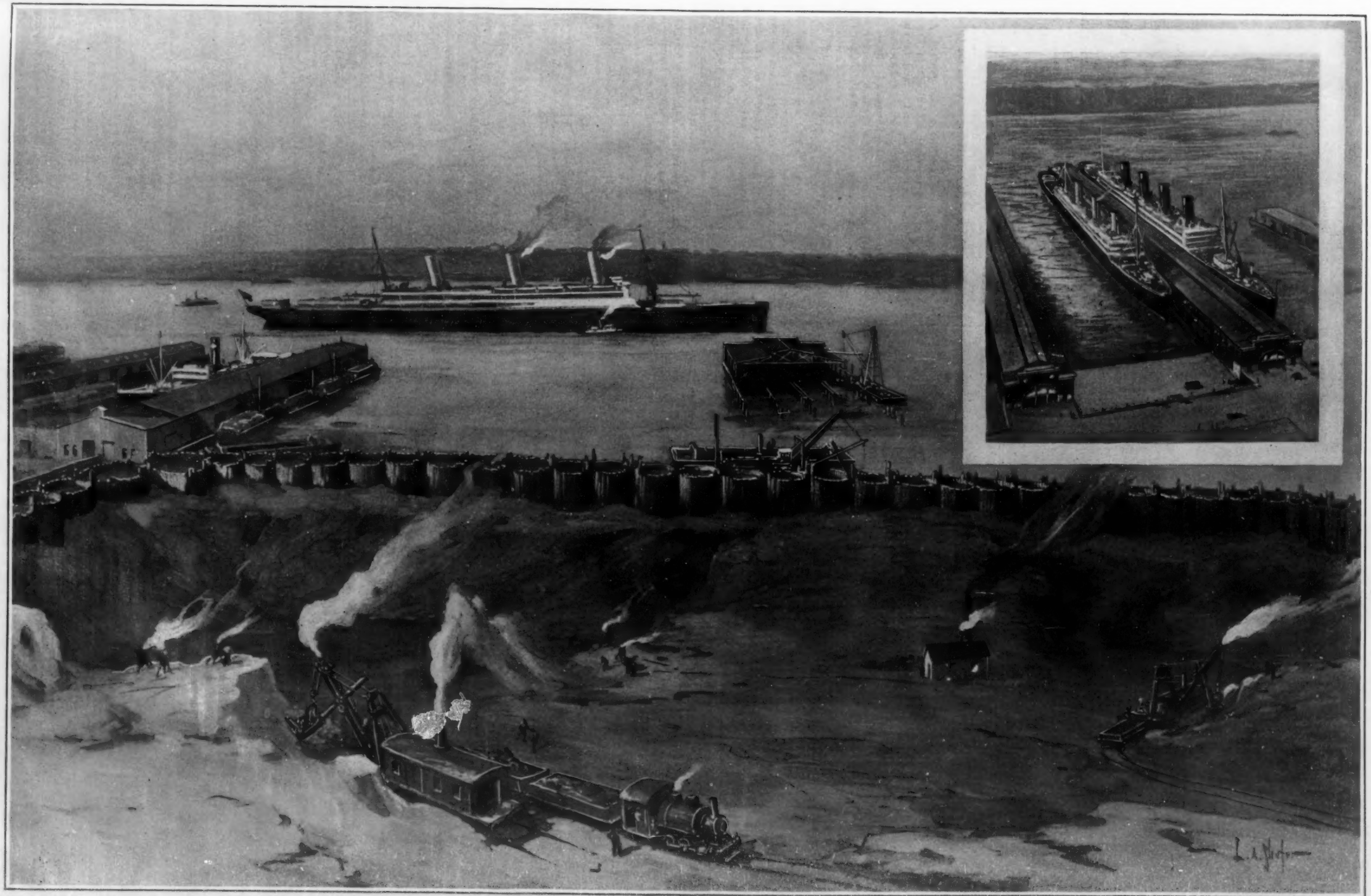
The Largest Fore-and-aft Schooner Yachts.

	Length on Deck.	Waterline Length.	Beam.
"Atlantic"	184 ft.	135 ft.	29 ft.
"Karina"	198 ft.	148 ft.	33 ft. 8½ in.
New Yacht	210 ft.	150 ft.	33 ft.

The model of the new schooner is particularly handsome, and her form is so sweetly modeled that the expectations of her designer that she will realize from 17 to 18 knots in strong winds, and under the most favorable conditions bid fair to be fully realized. Although she is designed primarily for extended ocean cruising, her vast sail-spread will probably make her more than a match for her competitors when she is sailing under full racing canvas. Her length of 150 feet on the waterline and 210 feet on deck, and her beam of 33 feet and draft of 18 feet, to say nothing of her high freeboard, will render her a particularly commodious and able ocean-going yacht.

For calm weather and for maneuvering in making and leaving harbor, she is provided with a gasoline engine of 300 horse-power, which will be capable of driving her at 10 knots.

The new yacht will be furnished simply throughout in accordance with the taste of her owner, and she will have accommodations for 8 guests and a crew of 35 men. She carries a cold storage ice plant, and is electrically lighted throughout.



This view shows the cofferdam, with water pumped out and rock excavation in progress. The insert shows work as it will appear when completed.

BUILDING THE CITY'S NEW PIERS IN THE HUDSON RIVER.

Fog and Marine Disasters

By Dr. Félix Bertyn, Royal Observatory of Belgium

THE collision of the transatlantic liner "Empress of Ireland" and the steam collier "Storstad" off Rimouski, at the mouth of the St. Lawrence, during the night of May 28-29th, 1914, renders the subject of fog a matter of timely scientific interest, because it is now beyond doubt that the catastrophe, if not caused, was at least favored, by one of those ambulatory fogs to which the sailors of my country, by whom they are greatly dreaded, apply the expressive name of *bouchons de brume* ("fog-plugs").[1]

As the existence of this type of fog is generally unknown to the public, and even to scientific men—and consequently the occurrence of this erratic phenomenon at the time of the catastrophe passed almost without notice—it seems useful as well as opportune to devote a short note to the subject. We feel the more justified in doing this for the reason that we have previously made personal investigations on the subject (see *Ciel et Terre*, 1912, p. 67), and because the honor of having first called attention to the phenomenon in question belongs to two Belgian meteorologists, viz., Dr. Vanderlinden and the late Dr. Lancaster.

First of all—what is a *bouchon de brume*? It is a bank of low fog, or sometimes of smoke, having more or less sharply-defined boundaries, variable in size, and moving with the wind. Dutch sailors call it *mistbal*. Its appearance may be described as follows:

The atmosphere, being generally clear, there is suddenly seen to arise an immense fog-bank, whitish or dark in color, which gradually fills the whole horizon. As it approaches it assumes the aspect of a compact mass of vapor, rapidly advancing, and suddenly one finds oneself plunged in the midst of it. The phenomenon lasts fifteen to twenty minutes, and then, as the fog passes, the observer emerges as suddenly into the clear light of day. The phenomenon may occur on land as well as at sea, but it is more frequent over the water and at the mouths of rivers. It may occur either alone, or, more often, in connection with a general fog, of which it then constitutes a denser portion, with independent movement. It is more dangerous to the navigator than an ordinary more or less dense and more or less stationary fog because it cuts off his view suddenly; vessels which have sighted each other and exchanged signals are, in the twinkling of an eye, enveloped in an impenetrable veil, and, if fate so wills it, a collision is inevitable.

The mouth of the Scheldt was the theater of an accident of this kind December 20th, 1899, when the steamer "Luciana" ran into the "Maggie MacNair," which lay at anchor off Terneuzen. The latter vessel was seriously damaged and lost part of her cargo. The whole loss was estimated at 3,000,000 francs. A lawsuit resulted, and in the course of the arguments the existence of *bouchons de brume* came up for discussion, as the captain of the "Luciana" declared that, having been suddenly enveloped in one of these moving fogs, he did not have time to slacken the speed of his vessel before the collision occurred. In order to verify this statement the court ordered an inquiry into the subject of these fogs, the results of which confirmed the captain's statement and led to a compromise of the suit.

According to observations collected by the United States Hydrographic Office during the years 1901 to 1906, the region between Newfoundland and Nova Scotia has one day with fog in three during the month of May. A little farther east fog occurs one day in two. Everybody who has made the voyage to America has encountered these fogs, which sometimes give one the impression of traveling through cotton wool. A fog is merely a cloud resting on the earth's surface. Its origin is the same as that of the clouds, and it is of the same composition, differing only in its altitude. Like the clouds, it results from the condensation of atmospheric moisture. On land it is produced by the meeting, near the ground, of two atmospheric currents, one warm and one cold; the latter reacts on the former, robbing it of its heat and precipitating its water vapor in a liquid form. At sea fogs are engendered either by the action of marine currents, some warm and some cold, on the lower atmosphere, or by the influence of mild southerly winds blowing over a sea-surface, initially cold and cooled still further by icebergs and drifting ice.[2]

[The peculiar type of fog mentioned in this article was described at length by Dr. E. Vanderlinden, one of Dr. Bertyn's colleagues at the Royal Observatory of Belgium, in *Ciel et Terre* (Brussels), vol. 28, 1907, p. 159 ffg.—EDITOR.]

[1] They are also known as *balles de brouillard* ("fog-balls").—EDITOR.

[2] More definite explanations will be found in works on meteorology. Some particularly lucid statements on the subject are given in W. N. Shaw's "Forecasting Weather" (London, 1911).—EDITOR.

Bringing a Rudderless Ship Into Port

THE handiness of the sailorman is proverbial; and not infrequently emergencies occur on the high seas when this handiness has to be backed up by a considerable amount of intelligence, patience and courage. One of the most dangerous accidents that can happen to any ship is the loss, or complete disablement, of the rudder; and when the ship is of large size the difficulties of making repairs, or of rigging some kind of jury rudder, become multiplied. We were recently favored with a visit from Capt. Arthur N. McGray of the large freight steamer "Herman Frasch," which was built for carrying sulphur from the gulf to north Atlantic ports. The "Herman Frasch," on a recent trip from the gulf, had the misfortune, during heavy weather, to break her rudder, between the two upper pintles of the rudder post, as shown in one of our illustrations. The captain determined to make an effort to bring his ship into the nearest port by rigging a jury rudder. To this end he made fast 90 feet of 2½-inch chain to several hundred feet of 12-inch hawser, which, immediately abaft of the stern of the ship, was made fast to two lengths of 7-inch hawser. These hawsers were led, one to port and one to starboard, through snatch-blocks carried at the end of two derrick booms, which were lashed together at their inner ends, and made secure transversely on the after end of the poop deck. After passing through the snatch-blocks the 7-inch hawsers were led to a pair of winches. The depth of water at the place of the accident was about one hundred and twenty feet, with a sandy bottom.

Starboard boom, with jury steering cable leading through snatch-block.

The fracture in the rudder of the freighter "Herman Frasch."

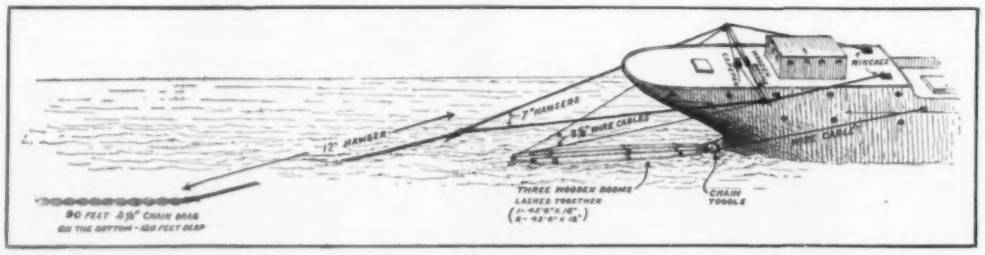


Diagram showing the jury rudders by which the "Herman Frasch" was brought into port.

Now it will be readily seen that by slacking off on the starboard 7-inch hawser and hauling in on the port hawser, the drag of the 90 feet of chain on the bottom would tend to swing the stern of the ship over to starboard, and, *vice versa*, slacking the port hawser and hauling on the starboard hawser would tend to swing the stern over to port.

The work of the drag was supplemented by another jury rudder, which consisted of three heavy wooden booms, the center one measuring 16 inches diameter by 45 feet long, and the two on the outside 12 inches diameter by 42 feet long. The three booms were strongly tied together with wire cable. At the forward end of the booms there was attached a loop of chain, and from this two wire ropes led, one to starboard, the other to port, through hawse holes and were made fast. From the after end of the booms, two 2½-inch wire cables led through snatch-blocks in the ends of the transverse booms, above mentioned, to a capstan on the poop deck. The arrangement made it possible to swing the outer or after end of the three booms over to port or starboard, and produced an additional turning effect on the ship.

By means of this gear, with the engine making from seven to eight knots, it was possible to make about three knots of the desired course; and ultimately Capt. McGray was able to bring the "Herman Frasch" into the nearest harbor for temporary repairs.

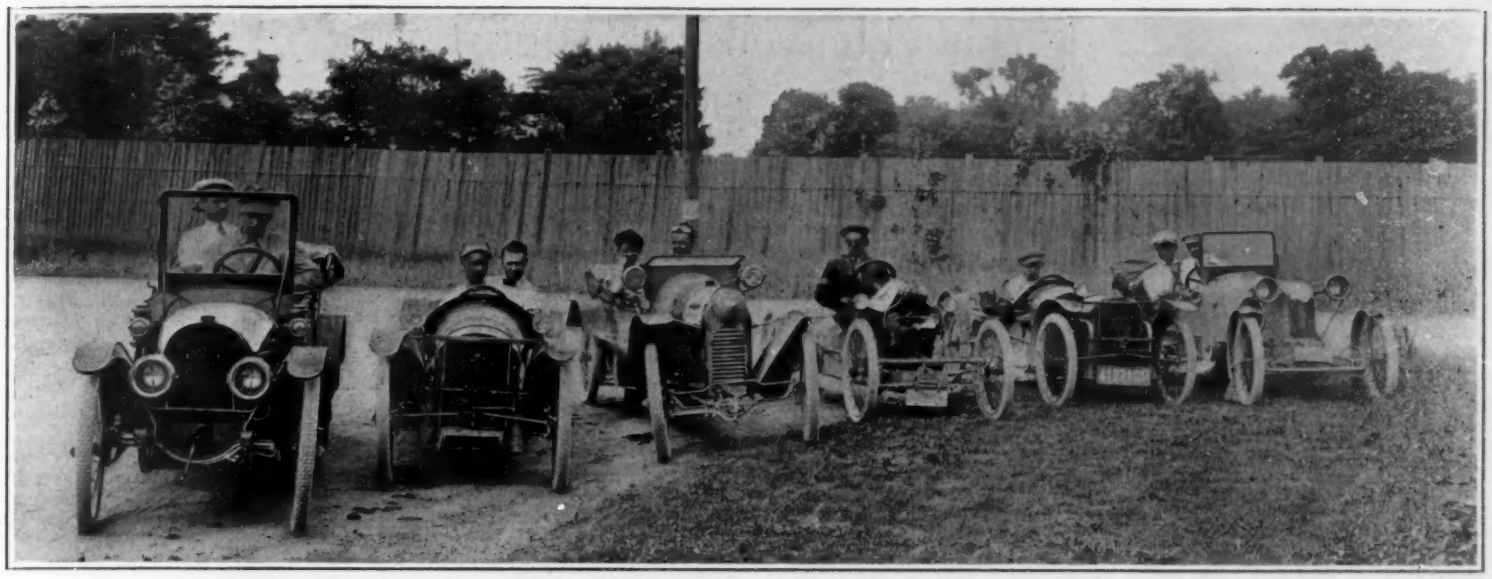
Radium and Cancer

THE radium treatment of cancer has aroused public discussion only equaled in sensationalism by the popular furore over the Friedmann treatment for tuberculosis. That this substance has some value in the treatment of cancer cannot be denied, but unfortunately the public has gotten an exaggerated impression of its effects, and radium has been hailed as the long-waited specific cure for malignant disease. In the belief that a statement of results would be useful, the American Society for the Control of Cancer recently asked Dr. H. H. Janeway of New York to prepare an article on this subject, which has just been published in the *Journal of the American Medical Association*, in which the following comments appear:

"Dr. Janeway discusses the results secured with radium at the four principal institutions in Europe where it has been employed under the most favorable conditions, viz., Paris, London, Vienna, and Heidelberg. The reports from each of these European institutes justify the statement that radium exerts a selective and destructive action on the majority of cancers, but that this action never reaches to the more distant extensions of the deeper and more serious forms of the disease. In fact, there is good ground for belief that unless the greatest care is used in the application of radium the more distant portions of the cancer will be stimulated to more active growth. All users of radium emphatically express the belief that no operable cancers except those of the skin should be treated by radium in preference to operation. The true position of radium at present is that it does not cure the disease unless the cancer is superficial or is of a variety particularly susceptible to its influence.

"For the last nine years, Dr. Wickham of Paris has treated 1,000 cancer patients at the Laboratoire Biologique du Radium, and has found that, while the influence of radium on all types of cancer is favorable, its effects do not extend to the limits of the disease in any but the most superficial varieties. The Radium Institute of London treated 467 cases during 1912. No patient has been classified as cured, since cancer is not regarded as cured until at least three years have elapsed without recurrence of the disease. Of 101 patients with the slow-growing, benign form of cancer of the skin, 31 were apparently cured, 41 were improved, and 12 did not improve. In cancer of the rest of the body, 15 cases were apparently cured, 156 improved, and 45 which did not improve. At the Vienna Radium Institute, of 34 patients treated for all forms of cancer, 6 died during the treatment, 11 were essentially improved, 6 were slightly improved, and 3 were made worse. At the Samaritan Hospital in Heidelberg improvement was produced in about half of the cases, but no patient was cured. The establishment of the fact that we have in radio-activity an agent which will even specifically affect cancer is of very great importance. No other agent has been discovered which in any degree approaches its effectiveness. But from the evidence at hand, it is clear that at present radium may only supplement, but not replace, surgical treatment."

Atomic Weights of Nebular Elements.—Nicholson has given a theory to explain the existence of certain rays in the spectra of the nebulae, those of hydrogen and helium particularly. Each atom is regarded as consisting of a nucleus having the quantities $+e$, $+2e$, $+3e$, etc., of positive electricity and surrounded by a ring of electrons, each having the quantity $-e$ of negative electricity. For nebulium, the nucleus would have the quantity $+4e$ of positive electricity and would be surrounded by 4 electrons. Considerations of this nature enable the existence of 9 simple elements to be predicted (protohydrogen, nebulium, protofluorin, archonium, etc.).



A delegation of cyclecars from Chicago and Detroit arriving at Indianapolis during the international automobile races.

Will the Cyclecar Come Into Its Own?

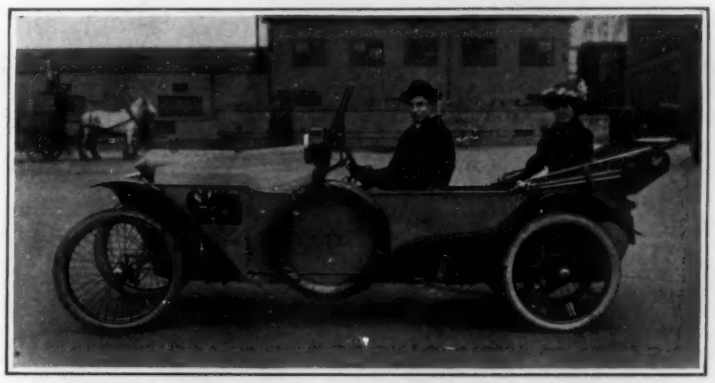
Possibilities and Limitations of the Light Vehicle in This Country

By John S. Harwhite

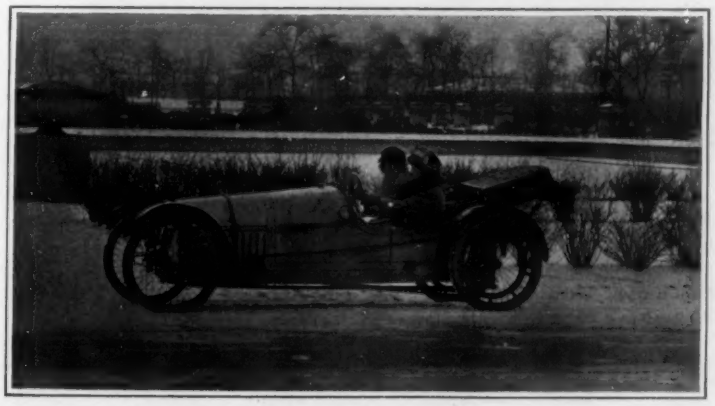
TO many, the cyclecar is the unwelcome latest addition to the flourishing self-propelled-vehicle family; it is deemed unnecessary and is considered to overlap the fields so well filled by the small motorcar and the motorcycle with sidecar attached. The narrow tread is cited as being eminently unfitted for our average country roads, and the short wheelbase and light weight is thought to render riding comfortable only on the veriest boulevard. But are these beliefs warranted? Is the cyclecar movement doomed to a sporadic inception and a rapid death? Will the low-priced automobile and the constantly bettered design of the motorcycle and sidecar meet to fill the field now occupied by the cyclecar? The answer to these questions cannot be found in any previous motor vehicle building experience; the cyclecar proposition is a new one, and even England, the mother of the movement, does not furnish the solution, for in that country conditions are so totally different that they offer no comparison; our average roads are poorer, our automobile-owning class is different, and the high tax on motorcars above a certain weight that really started the light-car agitation in England, is lacking here.

In this country, it is much a matter of psychology. With its million and a quarter automobiles and several hundred thousand motorcycles, it naturally seems as though almost everyone could afford to own a self-propelled vehicle of some kind. But every American is, at heart, an aristocrat; if his neighbor owns a $3,000 automobile, he too wants a "real automobile," even though he is able to afford one costing only one eighth of that amount, and in the minds of many, an automobile *must* run on four wheels. It has been the experience of the writer that the motorcycle with sidecar offers one of the most comfortable and economical means of transportation for two persons yet perfected, but "the motorcycle is *not* an automobile." It is also difficult to convince those who have never had experience with the combination that the occupant of the saddle is comfortably mounted and is insulated from the shocks and jars that such persons firmly believe are the accompaniment of motorcycling.

In view of these desires and beliefs on the part of a large portion of the American public, it would seem that there is a fertile field for the production of a low-priced, four-wheeled, self-propelled vehicle. Some fifty manufacturers who have announced their intention of building this type of vehicle would seem to share this opinion, at least, but the fact remains that actual *proofs* of the feasibility of the cyclecar, based on the performance of commercial quantities in the hands of a large number of users, are lacking, and, therefore, a prediction as to the success or failure of the movement can only be based on what the cyclecar is, and what it will do. Astonishing test runs of the little vehicles through snow and mud that would daunt many a larger car have been published from time to time, but these are special demonstrations participated in by experts, and it is the day-in-and-day-out *practicability* of the vehicles that will count with ninety-nine out of every hundred would-be purchasers.



Note the several distinctive cyclecar features—the two-cylinder air-cooled motor, the tandem seats, and the cantilever springs.



The light cyclecar is essentially a vehicle that appeals to women, because of its simplicity and ease of operation.

As long as water can be kept out of the carbureter, the cyclecar with armored magneto can ford any stream.

For this side of the question, we must look to the design of the average cyclecar and endeavor to determine the end sought to be attained. Primarily, the cyclecar must be of low initial cost and light in weight. The actual price, size, and weight limits that distinguish the cyclecar from its "automobile" cousins have not as yet been generally accepted by all manufacturers, but it would seem that these figures should be less than those relating to the smallest and cheapest *bona fide* automobile on the market. The average of what is known as the cyclecar in this country will weigh from 600 to 900 pounds, and will cost from $350 to $500. So far as length of wheelbase and tread are concerned, we have rather indefinite figures, but the former seems to run from 90 to 100 inches. A much-mooted question among manufacturers is whether a real cyclecar can be built with the standard tread of 56 inches, but inasmuch as one of the distinguishing characteristics of the original cyclecars lies in their narrow tread, it would seem that all those possessing the standard width between wheels should properly be placed in the light-car class. It has been well pointed out by an enthusiastic cyclecar exponent that the true vehicle of this type should be a "minimum" car, minimum price, minimum weight, minimum complication of construction, and, as a result of these features, minimum cost of upkeep. It may be pointed out that the price of the cheapest of the cyclecars is not more than a hundred dollars less than the cost of one or two well-known makes of automobiles, and that some are priced at $25 more. But while the production of cyclecars in increasing quantities may serve to lower the initial cost, as has been the case with the automobile and the motorcycle, it must

(Concluded on page 88.)

The Heavens in August

The Solar Eclipse and the Theory of Relativity—Another Comet Found

By Henry Norris Russell, Ph.D.

THE principal event of the present month, from an astronomical standpoint, will undoubtedly be the total solar eclipse which occurs on the 21st. On this day an eclipse of some sort will be visible throughout all Europe, in northern Africa, western Asia, and the northeastern part of North America. The narrow track of the dark shadow, or umbra, of the Moon, which nowhere exceeds 100 miles in breadth, begins off the Arctic coast of Canada, where the Sun will be eclipsed as it rises. Few human eyes will see the eclipse from the first two thousand miles of its track, which crosses the Arctic archipelago and the snowy wastes of northern Greenland. Then, turning somewhat to the southward, the shadow traverses the northern Atlantic and reaches the Scandinavian Peninsula, which it crosses nearly at right angles, near the middle of its length. Passing next over the Baltic, it reaches Russia, across which it sweeps from Rega to the Crimea, passing over the city of Kieff on its way. Half an hour after it has left the Baltic, the shadow will be in the Black Sea; then it departs into the eastern regions of Asia Minor, crosses Persia diagonally, and leaves the earth at the western limits of India.

The most favorable stations for scientific observation will be in Russia, where the duration of totality is a maximum (2 minutes and 14 seconds), the Sun high, and the chances of clear weather relatively good. A number of expeditions from other countries, in addition to the well equipped Russian parties, will establish themselves at various points along this part of the track. The only American party is that from the Lick Observatory, under the able direction of Prof. Campbell, whose station will be not far from Kieff.

The usual observations of the spectrum of the Sun's outer atmosphere, and of the corona will be made, and, if only the weather is good, the powerful instruments employed should yield very valuable results. Of the investigations which have not yet been conducted, perhaps the most interesting is the photography of the region around the eclipsed Sun, with instruments of such a sort as to permit of the exact measurement of the apparent positions of the stars which may be detected upon the plates. There is no longer any hope that any planet, smaller and near the Sun than Mercury, may be discovered on these photographs; the careful search made at previous eclipses, notably by parties from the Lick Observatory, has practically settled this. But, according to certain phases of the new theory of relativity which is exciting so much discussion among physicists—and which those without physical training find so difficult to understand—according to some of the exponents of this theory, a beam of light, passing close to a great gravitative mass like the Sun, should be deviated a little from its rectilinear course—to the same extent, indeed, that a projectile moving with the velocity of light would be deflected by the Sun's attraction.

The theoretical deviation, even for a ray of light grazing the Sun, should be very small, only about one second of arc. As a star's light would be bent on toward the Sun, the stars, apparently near the Sun, but really far behind it, would, as can easily be seen, appear to be displaced on the sky outward from the Sun's center, by amounts diminishing with increasing angular distance from the Sun.

If this effect actually exists, it should be capable of detection upon plates taken with suitable instruments. It is not yet at all certain whether the theory which predicts such a phenomenon is really correct; but these astronomical observations should be capable of deciding the question—if not at the present opportunity, then at some future and more favorable one.

For observers in the United States, this eclipse will be a small, partial one, on the northern limb of the Sun, occurring in the early morning. From points east of a line drawn from Rochester, N. Y., to Washington, the whole eclipse is visible shortly after sunrise, at about 6 A. M. For points farther west, about as far as Chicago and Minneapolis, the Sun rises eclipsed.

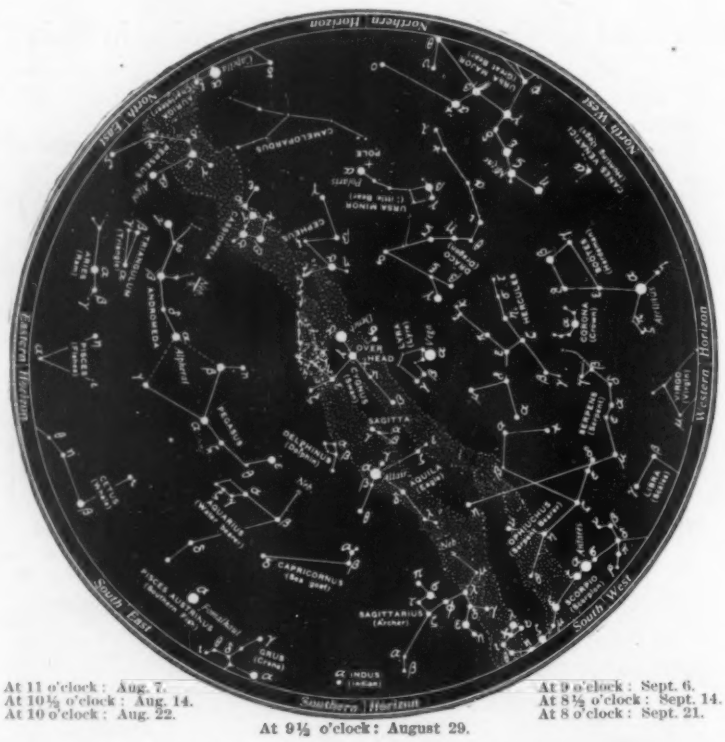
Another comet has been added to the list of the year's discoveries, found this time by the Russian Neujmin (who was the first to detect the remarkable faint comet of last year) on June 29th. The present comet is also faint, being visible only in a large telescope. The elements of its orbit show that it is already far past perihelion and has been receding from the Sun since March 4th. At that time it was a little over 100 million miles from the Sun, but now it is about 200 million miles from him and nearly 100 million from us, and is still receding and steadily growing fainter. Its computed positions are, for Greenwich, midnight July 6th, 17 hours, 58 minutes, 6 seconds — 11 degrees 19 minutes; July 18th, 17 hours, 49 minutes, 24 seconds — 9 degrees 20 minutes, which puts it not far from the star γ Ophiuchus, shown on our map. Beyond this date its motion will be at first northwestward, and then curve, so as to be almost directly northward, and will diminish to a small fraction of a degree per day; but the comet will be so faint by the time that this is published that it will be observable only with powerful instruments.

Delavan's comet is now in the morning sky, and is steadily growing brighter. It was seen just before dawn on June 30th by Mr. J. R. Hooper, an amateur astronomer of Baltimore, and must have been fairly bright to be seen at all so near the Sun.

Two careful computations of the orbit, which have recently appeared, agree in showing that the comet's path is very nearly parabolic, its period being probably at least ten thousand years, and very likely much longer.

On August 1st the comet will be in 6 hours 5 minutes right ascension, and 39 degrees north declination, about 3 degrees northeast of θ Aurigæ, near which it will pass on July 27th. On the 15th its position will be in 6 hours 55 minutes + 44 degrees, and it will continue to move, at a steadily increasing rate, almost along a line drawn from θ Aurigæ to ι and κ Ursæ Majoris, near which latter stars it will pass early in September.

All through the month it rises at midnight or earlier, and gets well clear of the horizon some time before dawn. The best time to observe it will be about 3 A. M. Its predicted brightness, making no allowance for the increase of intrinsic luminosity which comets usually show near perihelion, is about equal to that of a star of the sixth magnitude. It should, therefore, be easily visible with a field-glass, and probably with the naked eye. How much tail it will have cannot yet be predicted. The presence of moonlight will seriously interfere with seeing the comet from about the 3rd until the 20th, but it should be very easy to find before and after these dates.



At 11 o'clock: Aug. 7. At 9 o'clock: Sept. 6.
At 10½ o'clock: Aug. 14. At 8½ o'clock: Sept. 14.
At 10 o'clock: Aug. 22. At 8 o'clock: Sept. 21.

At 9½ o'clock: August 29.

NIGHT SKY: AUGUST AND SEPTEMBER.

The Heavens.

Right over head (and shown in the center of our map) are the splendid constellations Cygnus and Lyra. Just south of them are the small groups of Sagitta and Delphinus, and then the larger one of Aquila.

Below this, in the southwest, is a magnificent region of the Milky Way, extending down to the "Milk Dipper" of Sagittarius, and to Scorpio, which is now setting. To the left, almost due south, we see the twin stars of Capricornus, the upper one of which is a pretty double to the naked eye, and the lower one to a field-glass.

Fomalhaut, the one bright star of the Southern Fish, has risen in the southeast, and a part of Cetus may be seen farther to the left. Above these is the very barren region of Aquarius, and the few but conspicuous stars of Pegasus. Andromeda and Aries are north of east, and Perseus and Cassiopeia farther on, due northeast. Cepheus, Draco, and Ursa Minor occupy the upper north, above the Pole, and Ursa Major is well down in the northwest. Hercules, Corona, and Boötes are in the west, and the tangled forms of Ophiuchus and Serpens fill the southwestern sky.

The Planets.

Mercury is a morning star almost throughout the month, but is only well visible at its beginning. He is apparently farthest from the Sun on the 5th, being 19 degrees 14 minutes west of him, and on that date he rises about 3:40 A. M., and can easily be seen before dawn.

Venus is evening star in Virgo, and remains visible until between 8 and 9 P. M. She is very brilliant, and far outshines anything else in the western sky. During the month she takes part in two interesting conjunctions. The first is with Mars, on the evening of the 5th, when the two planets are but 10 minutes apart—only one third of the Moon's apparent diameter—and can hardly be separated by the unaided eye. The second close approach is to the bright star Spica, which will be within a degree of the planet on the evening of the 30th. Both conjunctions will be well worth looking at, particularly the first.

Mars, as appears from what has just been said, is also an evening star. Except at the beginning of the month, he sets earlier than Venus, and is not conspicuous.

Jupiter is in Capricornus, and comes to opposition on the 10th. Though still 17 degrees south of the celestial equator, he is better placed for observation than he has been for two or three years past, and is a beautiful telescopic object.

Saturn is a morning star in Gemini, rising about 1 A. M. in the middle of the month. Uranus is in Capricornus, and comes into opposition on the 2nd. His position on the 1st is right ascension, 20 hours, 49 minutes, 18 seconds; declination — 18 degrees 29 minutes; and, on the 29th, 20 hours, 44 minutes, 58 seconds — 18 degrees 46 minutes. With the aid of a good star map he may be identified, appearing as a star of the sixth magnitude.

Neptune is just past conjunction with the Sun, and is practically invisible.

The Moon is full on the 5th, at 8 P. M.; in her last quarter at the same hour on the 13th; new at 7 A. M. on the 21st, and in her first quarter at midnight on the 27th. She is nearest us on the 24th and farthest away on the 12th. She is in conjunction with Uranus on the 5th, Jupiter (rather closely) on the 6th, Saturn on the 16th, Neptune on the 19th, Mercury on the 20th, and with Venus and Mars on the 24th.

Avon, N. Y., July 21, 1914.

Soya Bean Products form a subject of steadily increasing prominence in the technical journals of the Old World. Soya milk is now produced by several factories in Europe and the Far East. A factory is about to be established in Liverpool at which it will be manufactured on a large scale according to the process of Dr. Fritz Gössel of Essen, Germany. It will be retailed in England at four cents a quart. The flour made from soya beans has recently found new uses in medical circles. Mixed with sweetened condensed milk it is recommended as an infant food when safe fresh milk is not obtainable. It is also valuable in the treatment of diabetes on account of the absence of starch.

Japanese Irrigation Pumps

THE accompanying illustrations should give the hint to enterprising pump manufacturers that their wares are needed in Japan. The photographs show the primitive methods still employed in that country for supplying water to the rice fields. The apparatus used consists essentially of an undershot millwheel in which power is applied to the wheel to raise the water. In other words the operation of the wheel is reversed. A glance at the photographs will show that the construction of the wheel is very ingenious, particularly in the case of the wheel operated by foot power. Each paddle is carried by a pair of spokes braced by a pair of struts that lie in the direction of the thrust of the operator's weight. At the end of each paddle-wheel is a short treadle piece on which the operator walks. Of course the advantage of this waterwheel lies in the fact that it can be made very cheaply, and the operating cost is low because labor is very cheap in the Orient. Nevertheless, it should be a simple matter to demonstrate that a power-driven pump is far more economical in the end, than these wheels belonging to the times of ancient Egypt.

Irrigation with a handwheel in Japan.

Flooding the rice fields with a treadmill.

The Clock in the Motor Car Wreck

A FOUR-PASSENGER motor car was crossing a railroad track near Omaha one night this summer when it was struck by a passenger train. What happened to the car is shown in the accompanying photograph. It was so completely shattered that every piece of the motor, body, etc., was reduced to junk. The remains of the car were scattered along the tracks for a distance of 500 feet.

As in most accidents, a freak condition was found among the ruins the next morning. The automobile was fitted with a clock speedometer combination. The automobile was struck at about midnight, and yet when the photograph was taken the next morning at 9:40 the clock was still running, and had not lost a minute.

On the morning after, the clock was still running.

A Steeple Jack's Climbing Irons

IT is quite a trick of boys to make wire climbers with which they can climb a smooth telegraph pole. Heavy telegraph wire is used and formed into a double ring, the larger ring encircling the pole, while the smaller one serves as a stirrup. The weight of the boy when carried by the stirrup causes the ring to bite into the pole and cling fast, but as soon as the stirrup is raised by the foot it releases the ring, permitting it to be slid up the pole to take a fresh hold farther up. With a device of this sort on each foot, it is a simple matter to climb the pole.

A very similar scheme has recently been utilized by a steeplejack who frequently finds it necessary to climb a flagpole for the purpose of painting it, or adjusting the pulleys at the top without marring the pole. He uses a wire ring fitted loosely around the pole, but carrying a pair of angle irons that are connected at the outer end to a block which serves as a footrest. It is very evident that the pressure on the foot rest causes the angle iron to take a hitch in the wire ring, making it bite into the pole. One of our photographs shows him at the top of a tall flagpole, trusting implicitly to his climbing irons while he plies the paint brush.

Medals Awarded Annually by the American Museum of Safety

THE SCIENTIFIC AMERICAN gold medal, for the most efficient safety device invented within a certain number of years and exhibited at the museum.

The Travelers' Insurance Company's gold medal, to the American employer who has achieved greatly in protecting the lives and limbs of workmen.

The Louis Livingston Seaman medal, founded by Dr. Louis Livingston Seaman, for progress and achievement in the promotion of hygiene and the mitigation of occupational disease.

The Rathenau gold medal of the Allgemeine Elektricitaets Gesellschaft of Berlin, for the best device or process in the electrical industry, safeguarding life and health.

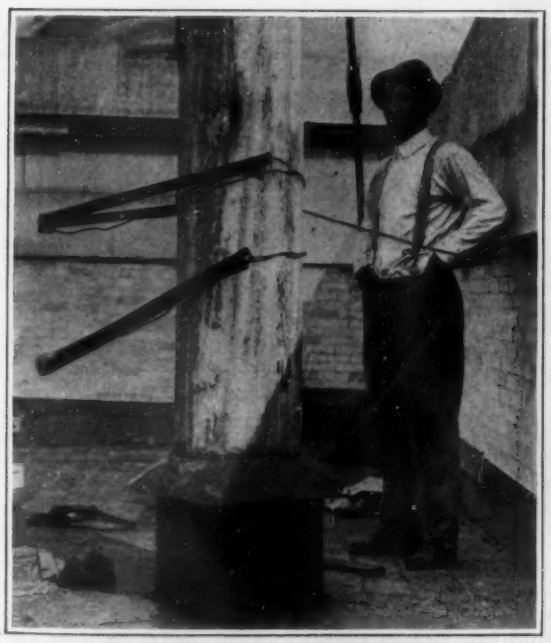
The E. H. Harriman memorial gold medal, founded by Mrs. Harriman, to be awarded to the American steam railway making the best record in accident prevention and industrial hygiene affecting the public and its own personnel during each current year.

Kite Signaling of the French Navy

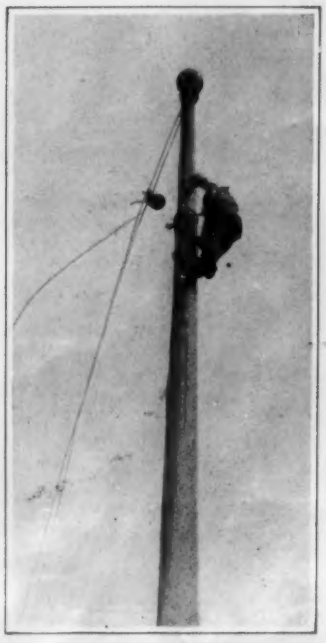
NOVEL ways of signaling were tried out recently during the naval maneuvers in the Mediterranean by men aboard the French warships. It was generally conceded that the tests with box kites were most efficient. The results proved that the box kites, being light, can be hoisted even when there is but a slight breeze; and their size makes them easily discernible from great distances.

The signal system used was similar to that of the flag system. Various combinations of kite grouping were used. While this system of signaling is not quite so fast as signaling by means of flags, it is more definite, it is claimed, and can be seen for miles around.

The success of the experiment has led to a recommendation to the French government that the system be introduced generally in the navy of France.



A steeple jack's climbing irons.



The human fly at work.

Kite signaling from a French battleship.

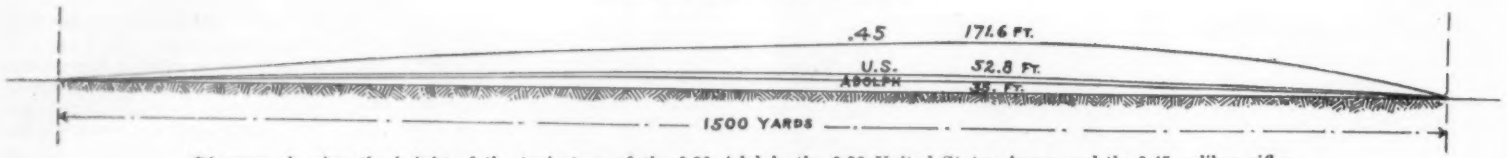


Diagram showing the height of the trajectory of the 0.30 Adolph, the 0.30 United States Army, and the 0.45 caliber rifles.

Super-high Velocity Cartridges and Three-barrel Guns

By Frank C. Perkins

THE accompanying illustration shows the most modern super-high velocity cartridges. Until recently the term high velocity was applied to cartridges which developed a velocity of about 2,200 foot-seconds. Through the use of Spitzer bullets and improved powders it has been possible to raise the velocity up to 2,700 feet in the United States Army 0.30 cartridges (No. 4), and 2,800 feet in the 0.22 Savage (No. 6).

The next step forward was indicated by the appearance of the Ross 280 cartridge (No. 2), which developed a velocity of 3,050 feet, with a 145-grain bullet. The shell is much larger than the shells of the Mauser type, and requires a longer magazine. The cartridges which have the highest velocity, combined with greatest energy, are to-day the 0.30 Adolph express and the 0.30 Newton express. The latter, indicated by No. 1 in the photo, is designed for use in single-shot rifles, double-barreled rifles, three- and four-barreled combination guns, where the thickness of the barrel has to be limited.

The 0.30 Adolph express (No. 3) shown in the photograph is a cartridge of the same ballistic properties as the 0.30 Newton express, but is rimless, and designed for use in the common Mauser actions. The velocity of this cartridge with a 150-grain Spitzer bullet is 3,208 foot-seconds, with a 170-grain bullet 3,000 foot-seconds. The energy of this cartridge is 3,445 foot-pounds. In order to understand fully the progress in this matter one has to look back to the time of black powder cartridges, when the same energy was obtained by a cartridge of 577 calibers, with 160 grains powder and a bullet of 520 grains weight. It was necessary to build rifles for the latter cartridge very heavy, to withstand the severe recoil, and such a gun weighed hardly less than 14 pounds. A great advantage of these modern cartridges is the extremely low trajectory, which greatly increases the danger zone. The trajectory at 500 yards of the 0.30 Adolph is only 1.37 feet, but for the 0.45 caliber it is 9.5 feet. For the United States 0.30 Army rifle it is slightly over 2 feet at the same range. At 1,500 yards the 0.45 rises 171.6 feet, the United States rifle 52.8 feet, and the Adolph 35.6 feet. A 0.30 Adolph express has fired a full-jacketed bullet, through about seven feet of pine. A three-barrel gun has been designed for the 0.30 Newton express cartridge, consisting of two shotgun barrels of 12 gage, with a rifle barrel below, the weight of which is 7½ pounds without scope. The accompanying ballistic table shows the difference between modern and old-time cartridges.

Range.	Bullet.	22 Sav. H. P. 68 gr. No. 6	Ross 280 145 gr. No. 2	30 U. S. G. 150 gr. No. 4	.30 cal. 150 gr. Adolph No. 3	45–70–500
Muzzle	Velocity, foot seconds.	2,800	3,050	2,700	3,208	1,201
	Energy, foot pounds.	1,190	3,002	2,445	3,445	1,602
500 Yd.	Velocity, foot seconds.	1,341	2,076	1,668	2,049	833
	Energy, foot pounds.	272	1,392	932	1,395	770
	Trajectory, feet	2.246	1.42	2.04	1.37	9.49
	Time Flight, seconds.	.784	.597	.709	.586	1.54
1,500 Yd.	Velocity, foot seconds.	641	998	853	928	434
	Energy, foot pounds.	62	319	244	285	210
	Trajectory, feet	71.8	32.0	52.8	35.6	171.6
	Time Flight, seconds.	4.26	2.83	3.45	2.98	6.55

A group of super-high velocity cartridges.

Forest Officers in Washington and Oregon plan to discontinue the use of barbed wire on their forests. This will affect their own pastures and public drift fences. They say barbed wire has no advantage over smooth wire, that it injures stock, and that it is more likely to be borne down by soft snow. Stockmen on the Ochoco forest, in Oregon, recently constructed drift fences of smooth wire, though with some misgivings; now they say they will never use barbed wire again.

Desiccated and Frozen Eggs

By Otto Maurer

THE young industry of desiccating eggs and preserving them by freezing the egg contents in bulk, seems destined to have a great future and to revolutionize the egg industry of this country. The desiccated product not only furnishes an excellent and highly nutritious substitute for fresh eggs, in compact form, to campers, explorers, sailors, and soldiers, but there is an increasing demand for it for general culinary purposes, and wherever eggs are used in large quantities, as for instance, in bakeries and restaurants. The product appears in the market chiefly in the form of golden yellow flakes, which are made ready for use by simply dissolving them in water.

A visit to a factory where desiccated and frozen eggs are prepared gives one a fair impression of the magnitude of the egg industry in general.

As the eggs arrive in the familiar egg crates from the dealers and small commission merchants they are immediately placed into a large refrigerated room, where they are quickly cooled to a point just above freezing to stop the growth of germs and to prevent decay during subsequent handling. The chilled eggs are then transferred, as soon as possible, to the candling room.

Here we see long rows of small darkened booths, from the background of which two circular spots of light of about the size of a half dollar stare at us. This is technically known as the candle. It usually consists of a bright electric light, which is inclosed in a metal or wooden case to keep in all the light, except what escapes through the two circular holes. The candler, usually a girl, juggles the eggs with great dexterity and rapidity before the light-holes so that the strong light shines through the eggs. This reveals all defects and abnormalities in the egg. A fresh egg presents a uniform yellowish hue, with a small air space at the blunt pole of somewhat lighter color. As the egg undergoes decomposition, through the activity of micro-organisms, it loses its transparency and uniformity of color and appears cloudy, often showing dark spots. Since there are numerous minute pores in the shell, evaporation goes on continually, producing a shrinking of the egg contents, with a consequent increase of the air-space. The size of the air-space, therefore, serves as an indicator of the age of the egg. During the hot summer months many eggs show what the candler calls a blood-ring, formed by the primitive blood-vessels of the developing chick. As she candles the eggs, the candler distributes them over various boxes representing as many different grades. All eggs that will not stand further shipment and that are unfit for the expensive cold storage, go to the breaking-room. This includes all cracked, dirty, watery eggs, and others that are perfectly fit for consumption, but which would be likely to spoil or break during further shipment or prolonged cold-storage. In the breaking-room cleanliness is even before godliness. This

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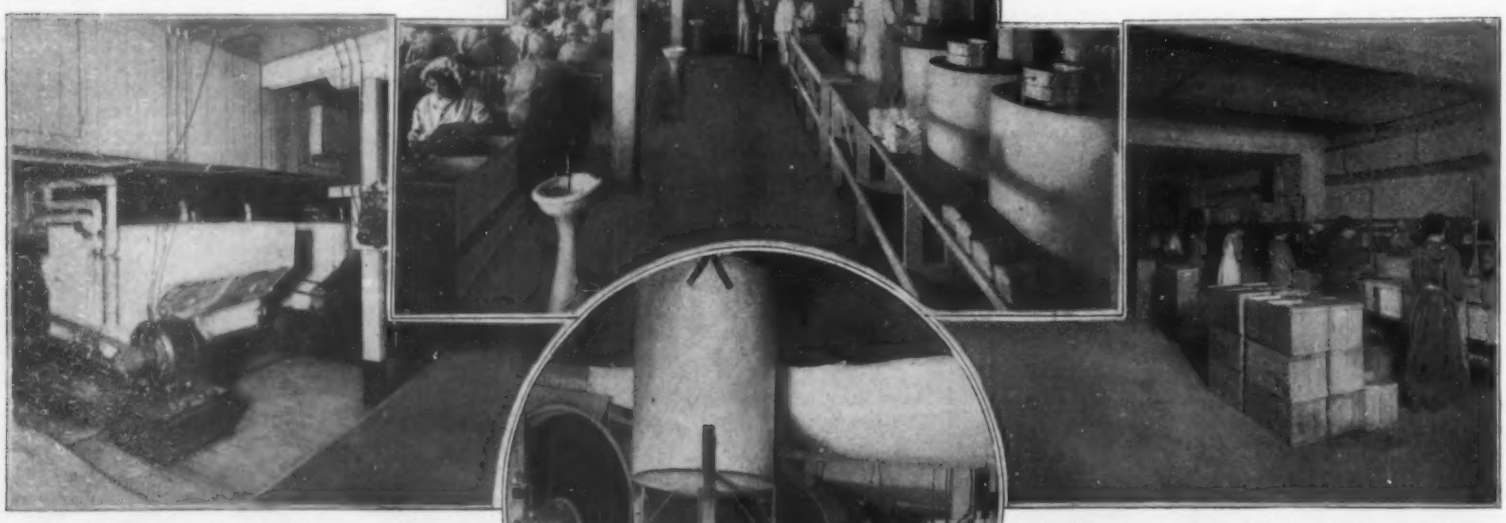
Breaking the eggs and separating white from yolk.



Where the air current is dried, filtered, and heated.

Where the egg is delivered upon the drying belts.

Candling the eggs for defects and abnormalities.

Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks

A Target Which Is Illuminated by Impact

A PATENT was recently granted to William H. Buell of New Haven, Conn., for a novel kind of target. Fire a bullet at the target, and a portion about the point of impact becomes momentarily illuminated.

A target which is illuminated by impact.

Thus the marksman can know at once whether or not he has made a bull's eye.

The outer or impact surface of the target is prepared with a thin superficial coating of any one of a great variety of flashlight compositions such as a composition of chlorate of potash, magnesium and collodion applied by an ordinary brush. When a bullet hits such a prepared surface, the composition is immediately ignited at the point of impact and flashes into light. The character of the composition is such that the ignition does not spread over the entire surface, but confines itself closely to a portion of the surface actually hit by the bullet.

Planting Hair on Bald Heads

MANY unsuccessful attempts have been made to cure baldness by the implantation of hair; but a hair planting method employed by Dr. Szekely in Buda-Pesth is claimed to be a practical one, by Prof. Havas. The method is described as follows in *Die Umschau:*

"The end of a gold wire 1/500 inch in diameter, is bent to form a loop, barely visible to the naked eye, which is threaded with a woman's hair of the desired color, soft, fine, and from 8 to 12 inches long (Fig. 1). The wire is introduced into a short, fine Pravaz hypodermic needle (Fig. 2) and drawn forward until the threaded loop is just inside the point of the needle. The wire is then bent back and cut to a length of 1/12 to 1/8 inch, forming a tiny hook (Fig. 3). Several hundred needles are prepared in this way, and are thoroughly sterilized before they are used.

"The part of the scalp which is to be planted is sterilized and made insensitive by appropriate treatment. The needle is inserted normally to the surface, but is then inclined, thrust forward under the skin and turned through an angle of 180 degrees. It is then carefully withdrawn, leaving the doubled hair anchored by the hook in the subcutaneous tissue. In this way pairs of hairs are implanted at distances of 1/25 inch, so that about 625 pairs, or 1,250 single hairs, are planted in a square inch. In a single treatment, occupying 30 to 45 minutes, 400 or 500 hairs can be planted.

"The slight inflammation which develops around the sterilized gold wire quickly subsides, and is succeeded by a scar, which attaches the hair still more firmly to the scalp. The puncture made by the needle is soon covered by new skin. The soreness caused by the inflammation is trifling, and is scarcely appreciable after

Fig. 1.—The loop of gold wire threaded with a hair.

Fig. 2.—The threaded wire is drawn through a Pravaz hypodermic needle.

Fig. 3.—The needle with the wire hook and hair ready for use.

Fig. 4.—Complete needle with hair.

10 or 12 days. I have not observed, in a single case, any ulceration, necrosis, or even severe inflammation. In every case the hair, if in perfect condition at the time of planting, remained firmly attached and showed no tendency to break off at the wire or elsewhere. The

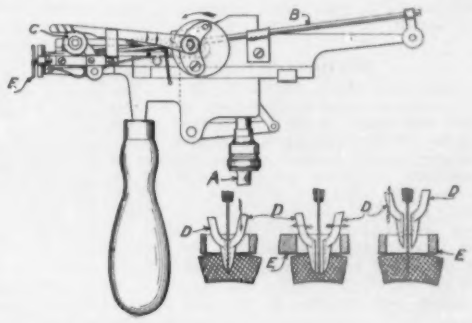


Fig. 5.—Instrument that plants hair at the rate of sixty per minute.

wire, in all probability, becomes imbedded in newly formed connective tissue, for it causes no pain when the scalp is massaged.

"Hitherto, operations have been confined to the scalp. The number of hairs implanted ranged from 10,000 to 50,000. From 15,000 to 20,000 hairs suffice to cover completely a bald crown, surrounded by a fringe of natural hair, but as many as 50,000 may be required for an entirely bald head. Even in this case little more than 15 grains of gold is consumed.

"The implanted hair presents so natural an appearance that it deceives the ordinary observer, and betrays its character, even to the specialist, only by the fact that the hairs are associated in pairs. It can be brushed, combed and washed, and it should be oiled occasionally in order to preserve its softness and gloss. In short, this method of planting hair is hygienic, cosmetic and practical. The permanence of the result is indicated by the fact that in one case, where the whole crown of the head was thus covered, the implanted hair has remained in perfect condition for seven years."

In this connection it may be interesting to note the hair-planting system developed by one of our countrymen—Dr. Jacob H. Parsegan—residing in San Francisco. Instead of looping the hair under the skin, he punctures the scalp and plants the hair in the puncture. A special instrument is used, capable of operating at a rate of sixty insertions per minute, if desired. Hairs of considerable length are fed through the instrument, planted, and cut off automatically to a gage adjustable as desired.

A sketch of the instrument is shown in Fig. 5, also three magnified views of the split needle, illustrating how

(Concluded on page 91.)

Planting hair on bald heads.

RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC AMERICAN.

Pertaining to Apparel.

GARMENT BAG.—D. B. FALK, German Bank Building, Savannah, Ga. The present invention is an improvement in garment bags, and consists in the provision of a top-closing flap which is in one piece and provided with means for receiving the head and shank of a garment hanger there-through, in such manner that when the flap is closed with the garment and garment hanger in proper position, the garment will be protected from dust, either temporarily or from season to season, as may be desired.

Electrical Devices.

ELECTRIC FAN TRACTOR.—M. P. SARFATY, 518 W. 143rd St., New York, N. Y. This invention conveys a fan so as to move the air in an apartment in layers or stratas, by imparting parallel impulses thereto; provides an automatic mechanism for moving a fan to operate in an ascertained plane and constant direction; provides automatic means for reversing the direction of travel of said fan at the terminals of its operating zone; and provides a tractor for supporting and moving said fan in the manner mentioned.

BURGLAR ALARM.—W. E. CLARK, Saranac Lake, N. Y. Address A. W. Botsford, same place. The invention relates more particularly to electrical alarms for preventing safe breaking in post offices, stores, and like places. It provides an entirely separate and distinct circuit between each of the circuit closers and the bell, and in practice the wires of these circuits are preferably run through different parts of the building, so that even though a safe-breaker discovers and cuts certain of the wires, the remaining circuits remain operative.

CIRCUIT CLOSER.—A. L. DAVIS, Clinton, S. C. The object of this invention is to provide a circuit closer for controlling the actuating means for railway gates. The circuit closers are placed along the railroad tracks a suitable distance on either side of the gate, and are designed to be operated by the wheels of a train to close the circuit in time to energize the actuating devices to lower the gates and temporarily close the crossing before the train which operates the circuit closer passes the point at which the gates are located.

ANTI-SPARKING DEVICE FOR DYNAMO ELECTRIC MACHINES.—L. R. AUVERT and A. F. E. FERRAND, 20 Boulevard Diderot, Paris, France. The subject of the present invention is a device enabling parasitic fluxes to be almost entirely suppressed in rotary converters, consequently reducing the tension of reactance of the commutator section to a very low figure, which tension forms the chief cause of the production of sparks at the commutators. In principle the invention consists in surrounding the ring of the transformer with a metallic casing, in such a manner that the parasitic fluxes are compelled to traverse metallic screens in which are generated secondary currents tending to nullify these parasitic fluxes.

ADVERTISING MEDIUM.—G. T. FIELDING, 575 Fordham Road, Bronx, New York. The present invention has for its object to provide a new and improved advertising medium, more especially designed for use in show windows and the like, and arranged to display an advertisement in conjunction with an imitation snowstorm, thus rendering the advertisement extremely attractive. This result is accomplished by using a compartment having a diaphanous front and back provided on its face with an advertisement and means for whirling flakes in imitation of snow through this compartment.

Of Interest to Farmers.

DITCHING PLOW.—E. B. WILSON, Box 115, Worland, Wyo. This plow is adapted to be used advantageously as a substitute for the ordinary plow, for cleaning out or deepening small side ditches or laterals of a main irrigating ditch. This plow is provided with a mold board whose rear upper portion is curved laterally away from the side on which the share is located, so that it discharges earth on the land side of the plow, instead of on what may be called the mold board side, and is thus adapted to run close under a bank and to deliver the earth thereon.

Of General Interest.

FUSE IGNITER.—R. A. W. KRAMPITZ, Valdez, Alaska. The principal object of this invention is to provide an igniter for lighting the fuses used in blasting. The apparatus is so arranged that a tongue of flame may be directed away from the operator for engaging the fuse to ignite it at the end, to prevent burning the fuse or igniting it, except at the end remote from the blast.

CIGARETTE BOX.—A. MENDELSON and S. J. GOLDBERG, 482 Marcy Ave., Brooklyn, N. Y. Messrs. Mendelson and Goldberg have just secured six patents on boxes for cigarettes or cigars, which when opened will relatively space the cigarettes, so that one may be removed from the box without touching or handling the others and fingering them. In the first patent, cigarette holders are carried by one of the sections of the box and held in such position that the cigarettes will be spaced apart in crossed relation when the box is opened, whereas when the box is closed the sections will be hinged in alinement and will snugly fit within the box. In the second patent, a box is provided with supporting means for the cigars or cigarettes in the form of supporting sections pivoted or hinged to the box sections and connected with the latter in such a manner as to be moved away from the box sections a limited distance, but to collapse with the sections when the box is closed, means being also provided to normally project the cigarettes beyond the box sections when the latter are opened. In the third patent, the box is provided with a supporting member hinged in the box body and designed normally to move to an upright position when the cover of the box is opened. This supporting member carries holders, or clamps, designed to move into spaced relation automatically upon the opening of the box. In the fourth patent, the cigarette box is provided with hinged sections mounted therein to support holders for the cigarettes, while a supporting member is also riveted in one or both sections, and by means of a connection with the opposite section of the box, is caused to move out of the area of the respective body or cover section in such a manner as to elevate the cigarettes by contact with the supporting sections carrying the same, the operation being wholly automatic upon the opening of the box. In the fifth patent, the object is to provide a box in which a plurality of holders are commonly connected so as to move in spaced relation when their carrying sections are moved outwardly, there being provided a central anchoring member in the box and a pair of outwardly moving holding sections. A sixth patent discloses a construction in which a plurality of holders are attached to an edge portion of one section of the box, comprising hinged sections, so that the cigarettes will be projected and will be capable of independent disposal in a position to be removed.

PENCIL HOLDER.—J. W. KYLE, 565 Marshall Ave., Memphis, Tenn. In order to hold a pencil securely in the pocket, Mr. Kyle has invented a holder consisting of a wire ring through which the pencil is passed, and an extension arm with a half loop at the lower end, adapted to bear against the body of the pencil. A spiral pin permits of fastening the holder to the pocket.

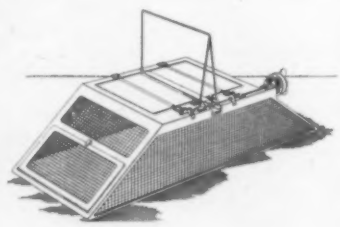
SHADE BRACKET.—J. M. PARKER, care Charles V. Schwall, 55 E. 59th St., New York. This invention relates to a bracket designed to receive the rectangular spring-controlled pintle of shade rollers, awning rods, and the like. It will be observed from the drawing that the

SHADE BRACKET.

bracket is provided with a novel arrangement of receiving recess with relation to the opening of the bracket and a recess in alignment with the opening, whereby the pintle can be inserted in a predetermined manner, but is incapable of accidentally releasing if the roller is subject to jolts or any other disturbing influence.

METHOD OF TREATING INGOTS.—H. W. HIXON, Box 11, Worthington, Ontario, Canada. In the present patent the invention relates to methods of treating ingots, the inventor's more particular purpose being to so produce the ingots as to avoid the formation of blow holes and to render the metal dense, smooth, and readily adapted for rolling.

ANIMAL TRAP.—T. A. WILLARD, 1301 Fifth St., Port Arthur, Texas. This trap is provided at its top with a trap door so arranged that when a rat or other animal attempts to eat the bait it will cause the trap



ANIMAL TRAP.

door to release and drop the rat into the cage. The trap door arrangement automatically resets itself so that any number of rats may be caught in succession before the trap has to be emptied.

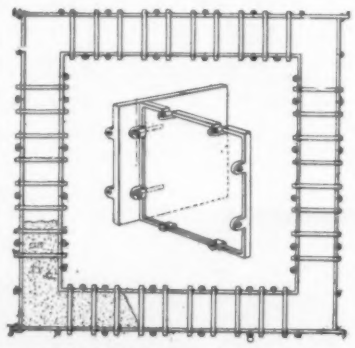
VENTILATOR FOR WINDOWS.—R. L. EGGLESTON, Houghton, Mich. This improvement refers to a ventilator in the nature of an attachment that is applied to a window frame at the sill thereof so as to allow air to enter a room when the lower sash is partly raised, and the invention relates more particularly to a combined screen and ventilator of this character.

THERMOMETER CARRIER.—F. LIEDTKE, Alsleben-on-the-Salle, Germany. This carrier is more especially designed for use on milk-heating vessels and other similar apparatus, and arranged to dispense with the use of specially constructed angular thermometers, to allow the use of an ordinary thermometer to test the same, and to permit of withdrawing samples of the liquid from the vessel to which the thermometer carrier is attached.

COMPOSITION FOR REMOVING COATINGS.—J. M. HUMPHREYS, 4318 Lafayette St., Dallas, Tex. The purpose of this invention is to provide a simple and efficient coating remover which will rapidly attack the coating and loosen the same from the surface to which it originally adhered, and it can then be removed from the surface by simply brushing or washing it off.

REINFORCED CONCRETE CONSTRUCTION.—W. APPLEBY, Napa, Cal. This invention provides a reinforcing plate with teeth projecting from the plate around holes therein, the teeth at each hole being bent laterally, substantially to the planes extending from the plate at the adjacent holes and parallel with the axes of the hole. The teeth extending from one side of the plate are bent laterally in general direction of the adjacent holes at the sides of which the teeth extend from the other side of the plate. Thus the cement will be held by the teeth at one side of the plate and will be directly united by the cement in the hole with the cement at the other side of the plate held by the teeth around the adjacent holes.

FORM FOR CONCRETE STRUCTURES.—J. S. O'KEIFF, 2803 Maple Ave., Altoona, Pa. The invention relates to forms or plates of suitable shape to be built into a mold to be used for concrete walls, the plates having such form that they may be readily connected together in different ways, and also as readily



FORM FOR CONCRETE STRUCTURES.

disengaged. Further, the invention provides an improved form of tie to be built into the wall, said tie being provided with means for facilitating the connection of the plates with each other and for bracing the wall molds as a whole until the concrete is set.

TYPE CARRIER.—A. E. STIGBERG, 346 48th St., Brooklyn, N. Y., N. Y. The invention provides a type carrier on which different sizes of type can be easily and quickly set and adjusted and whereby the printed matter may be made to appear in straight or sinuous lines and in any desired relation to the border of the object on which the matter is to be printed.

FIREPROOF DOOR.—A. C. GODDARD, 406 E. 93rd St., New York, N. Y. It is claimed for this fireproof door that it is insulated to the full size of the door opening, and when subjected to fire is not liable to warp or disintegrate, or have its sections come apart, even should the wooden core be reduced to charcoal. In its construction, use is made of a wooden core, wooden stile pieces, wooden rail pieces, inner and outer sheet metal coverings, and inner and outer layers of asbestos or other insulating material arranged between the core and the inner sheet metal covering and between the inner and outer sheet metal coverings.

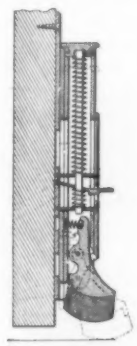
PAPER SAFETY PIN GUARD.—W. F. SPENCE, 38 Howard St., Charlestown, Mass. For a safety pin of the type provided with a guard in connection with the usual coil at one end, so as to prevent the fabric through which the pin is passed from working back into the coil and becoming caught, the present invention provides an improved form of guard that is simple and inexpensive to manufacture. While this improved guard may be made of metal, it has been found thoroughly efficient when made of a heavy, stiff waterproof paper.

Hardware and Tools.

DRILL.—F. R. WEATHERSBY, 312 Scanlan Bldg., Houston, Tex. This invention relates to drills of the general type disclosed in Mr. Weatherby's pending application, and patented November 4, 1913, his more particular purpose being to provide an improved form of shank, together with an improved form of disk detachably connected therewith, and means for connecting a disk or cutter with the disk.

LOCK AND KEY.—R. WALSER and A. SAUTER, 134 E. 125th St., New York, N. Y. The invention provides a lock which can be used for various purposes to which locks are usually put, but which may have combined therewith a special key provided with interchangeable bits, or an ordinary key, in which the lock may be adjusted for use with different keys or with different adjustments of a special key, which cannot be operated in an authorized manner without great difficulty, in which the lock can be adjusted without the use of the key itself, and which comprises few parts and is compact in form and inexpensive to manufacture.

DOOR-HOLDER.—EMILE FRANCKAERTS, 396 Waller St., San Francisco, Cal. Pictured in the accompanying engraving is a device for positively holding a door in an open position



DOOR-HOLDER.

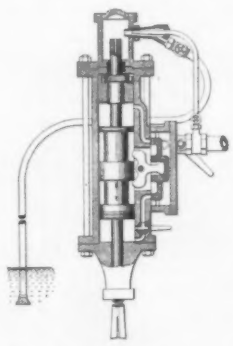
so as to prevent it from closing, even when considerable force is used, but which will instantly release when the release mechanism is operated. The door-holder has comparatively few parts, and hence may be cheaply manufactured, and it is so designed that it is not liable to get out of order easily.

DRILL ROD COUPLING.—E. J. LOWE, Balboa, Canal Zone. Mr. Lowe's invention has reference to couplings for drill rods for holding drill points rigid relatively to the main rod, and it has for its object the provision of

DRILL ROD COUPLING.

means which will automatically take up any and all slack in the coupling, which may be occasioned by the wearing of the parts under the severe usage under which a drill is normally put.

ROCK DRILL.—J. T. CURNOW, Baltic Club House, Palatka, Mich. This inventor provides a drill and means for operating the same, adapted to introduce an aerated water-jet at the point of application of the drill head; provides simple and efficient means for control-



ROCK DRILL.

ling the volume and aeration of the water-jet; and provides manually operated means for cushioning the blow of a drill, to avoid breaking the same. The engraving shows a vertical section taken on the median line of a rock drill and jetting attachment.

Heating and Lighting.

BAKER'S OVEN.—G. H. MCCAUSLAND, 1740 Tasker St., Philadelphia, Pa. The invention discloses a construction in which means is provided for carrying away any steam which has escaped from the oven between the edge of the oven door and the wall or door frame. The oven door is of novel form, having channels along in edges with means for circulating air through the channels to carry away the steam into a flue leading to the chimney.

GREENHOUSE CONSTRUCTION.—A. EICHHORN, 81 Essex Ave., Orange, N. J. With a view to preventing the breaking or cracking of glass panes under the expansion and contraction of the metal framework of a greenhouse, this invention provides for so arranging the pane-carrying bars with respect to the metal framework that the bars are approximately wholly out of contact with the latter, but firmly secured thereto. The isolation of the wood from the metal is advantageous, for the life of the wood is greatly prolonged.

INCANDESCENT GAS MANTLE.—J. I. ROBIN, 54 Cheapside, and C. WHITE, 30 Randolph Gardens, London, England. This invention relates to inverted incandescent gas mantles, and has for its object to provide a mantle which can be produced very simply and cheaply, as it requires no skilled labor in its construction and no special packing when the mantle is to be transported. The mantle is formed from a number of flexible loose strands of any suitable material impregnated with a solution of rare earth compound.

LAMP AND ATTACHMENT THEREFOR.—A. F. SCHNEIDER, 506 W. Jersey St., Elizabeth, N. J. The lamp disclosed in this patent is provided with attachments whereby it may be used as a heater or a stove. An article-supporting member is provided, which may be easily applied or removed without affecting the lamp, and which may be used as a stove attachment or as a support for a shade for the lamp.

Household Utilities.

EGG BEATER.—N. BLEULER, South Bend, Ind. This invention relates to culinary apparatus, and particularly to beaters and stirrers generally. The invention produces a rotary beater having several related parts which may be readily disconnected for sanitary and cleansing purposes, the device consisting of the fewest possible number of separate parts and adapted to occupy a minimum amount of space proportional to its agitating or beating efficiency.

EGG BEATER.

WINDOW SCREEN.—J. C. SMITH, 220 Swetland Bldg., Portland, Ore. This invention relates to window screens, and one of the principal objects thereof is to provide a screen having a housing therefor to protect the screen from the elements, and also to provide means for guiding the edges of the screen as the same is raised or lowered.

RUG FASTENER.—R. K. MYERS, 10911 Hathaway Ave., Cleveland, Ohio. In order to fasten carpets or rugs to the floor, Mr. Myers provides an inexpensive device which can be easily and quickly secured to a rug and then removably affixed to a floor. This fastener will hold the rug securely and will be unobtrusive.

IRONING BOARD ATTACHMENT FOR TABLES.—J. and L. MEIBACH, 398 Madison St., New York, N. Y. The invention relates to ironing board attachment for kitchen cabinets or other tables. An ironing board of peculiar construction is provided, which is housed within or beneath the table top when out of use, leaving the table top smooth and clear for the usual purposes. When in position for laundering, a portion of the table will be lifted and turned back, causing the ironing board to be elevated, and there supported in steady, stable position.

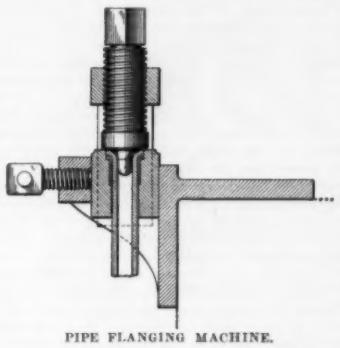
Machines and Mechanical Devices.

TOOL FOR TREATING ARTIFICIAL STONE.—J. O. BERG, New York, N. Y. This inventor provides a tool having a casing with projections for engaging a member to be finished, and with a shaft journaled in bearings in the casing and having a cutting head, the shaft and the cutting head being held yieldingly extended within the projections by a spring in the casing.

SPROCKET AND CHAIN THEREFOR.—C. P. BROWNING, Salt Point, N. Y. This invention relates to an improved sprocket and chain adapted particularly for translating rotary motion into reciprocating, whereby from a given rotation any desired reciprocating length of stroke may be provided. An object in view is to provide a chain and sprocket formed with means for preventing the chain from sagging and with means co-acting with the flange on the sprocket wheel for withstanding side pressure.

ORE CONCENTRATOR.—P. H. DARRAH, Goodyears Bar, Cal. The invention has particular reference to means for acting mechanically for the separation of dry ores. Among the objects is to provide a machine having various adjustments or capabilities of action so as to meet the demands of various types or conditions of ores to be treated.

PIPE FLANGING MACHINE.—W. J. HATTON, Escanaba, Mich. This machine is designed rapidly and reliably to form the ends of lead pipes with flanges in connection with bushings or collars, whereby such pipes may be connected to each other by any suitable coupling means acting through said collars, and whereby the usual wiped joints may be avoided.



PIPE FLANGING MACHINE.

MONOPRINT MULTICOLOR ATTACHMENT FOR PRINTING PRESSES.—E. H. BOBBITT, 304 Eureka St., San Francisco, Cal. This invention has for its object to provide an attachment for printing presses having a sectional strip for use with a plurality of colors, and a sectional reciprocating roller, the sections of the latter engaging the sections of the strip respectively for distributing ink on the latter.

SCALE.—I. CHARET, 552 Sutter Ave., Brooklyn, N. Y., N. Y. The principal object here is a construction or articulation between the actuating mechanism and the indicating mechanism. In the performance, means are utilized which tend to cause movement of the pointer over the scale, such means being held inoperative, the said means fluctuating, however, when a load is placed on the scales.

GRAMOPHONE RECORD CLEANER.—W. G. PEARSON, Plummer Ave., Newburyport, Mass. This improvement comprises a cleaner for gramophone records, the construction and arrangement being such that records may be cleaned thoroughly and in a short time, the device being inexpensive in its make-up, whereby it may be offered at a low price.

PROPELLING OR RECEIVING FLUID REACTION MACHINE ESPECIALLY APPLICABLE TO AERIAL NAVIGATION.—G. DESAULLES, 21 Rue Georges Sand, Paris, France. This invention provides a device for obtaining in transformations of work a better utilization, and, especially in the case of aerial navigation, to give to the device more powerful means of action, a greater stability, and, consequently, a more extended sphere of action. In the invention, it is the forces generated by the very movement of the machine, reaction of the fluids, under the influence of the speed and centrifugal force which place the elements in their most advantageous position either for supplying of generating work or for offering the minimum resistance to the movement.

METAL PRECIPITATING DEVICE.—F. A. ROSS, Spokane, Wash. Address Chalmers & Williams, Chicago Heights, Ill. An object here is to provide a device in which the metal precipitant is broken up into small parts and in which these parts are constantly agitated so as to cause the engagement of one particle by another, thereby keeping the surface of the metal bright and clean, thus expediting the process.

TYPE WRITER.—M. N. THRONE, care of Secretary Commonwealth, Harrisburg, Pa. This inventor provides a device in which the type bars are carried in a segment which may be shifted vertically for writing capitals or upper case letters, and in which, means is provided for dispensing with certain operations which are necessary in the ordinary machine, thus rendering the device capable of greater speed.

Prime Movers and Their Accessories.

ATOMIZER.—E. J. FRANKLIN, 1610 W. 10th St., Los Angeles, Cal. This atomizer has a spraying nozzle located inside of the main tube, so that the lubricant can be divided and distributed before it issues from the outlet. This outlet is preferably located in the conduit through which the motive agent is supplied to the engine, and is so located that it faces the direction in which the motive agent is flowing. The device is for use in supplying lubricant to steam, gas, air, or other engines. Mr. Franklin has invented another atomizer to supply lubricant to the above-named types of engines, and so constructed that it can be used with oil, graphite, mica, or any other lubricating material. The atomizer can be caused to project into the conduit which supplies the motive agent to the engine, and in practice will have its discharge aperture turned against the direction of flow of the motive agent, so as to make the atomizing action and distribution of the lubricating material more efficient and uniform.

AIR VALVE FOR INTERNAL COMBUSTION ENGINES.—A. G. GARBUTT, Statenville, Ga. This inventor provides a valve, automatic in its action, and controlled by the degree of vacuum obtaining in the manifold pipe, so as to increase the air supply as the vacuum diminishes, and to diminish the air supply as the vacuum increases.

PUMP OR MOTOR.—F. REAUGH, Oak Cliff, Texas. The pistons of this machine are mounted on the rotor to revolve around the stationary core and also to rotate at uniform speed on their own axes, this rotation being so timed that, while they pass through the working chambers broadwise, they turn to pass through the throat edgewise. The pistons are slightly thinner at the edges, so that they and the intervening flanges are always a close fit in the throat and prevent fluid leaking therethrough. The pistons are perfectly balanced, all their motions are evenly rotary, and they enter and leave with a feathered movement.

GAS ENGINE.—P. SUMBLER, care Agnew & Agnew, Plattsburg, N. Y. Among the objects of this invention is to provide a means for operating the engine valve, the ignition timer, and other necessary auxiliary working parts without the use of spur, bevel, spiral, or other toothed gearing. A further object is to render it more simple to take down and reassemble an engine for repairs or inspection, and to make the engine lighter and more compact.

Pertaining to Recreation.

ARTIFICIAL FISH BAIT.—L. SCHOLL, Jr., Echo, Ore. This invention is an improvement in artificial flies, and consists more particularly in the attachment of the leader to the upper portion of the hook shank and in the arrangement of the head portion of the body of the fly on the tail of the shank or at a point above the attachment of the leader, whereby important advantages are attained.

ARTIFICIAL FISH BAIT.

KNOCKDOWN CAROUSEL.—S. W. BRUNDAGE, Leavenworth, Kan. The inventor provides improvements in knock-down carousels or merry-go-rounds, whereby the parts can be conveniently and quickly assembled and securely fastened in place when setting up the carousel, and the parts can be quickly disassembled whenever desired to take the carousel apart for shipping or storing purposes.

Railways and Their Accessories.

TRAIN PIPE COUPLING.—H. O. WITWER, New Hamburg, Ontario, Canada. This automatic coupling is arranged to insure an automatic coupling of the train pipes of two cars coming together, to cut off the fluid pressure in the train pipes on the cars being uncoupled, to cause an emergency application of the fluid pressure brakes in case the cars accidentally break apart, and to provide electrical connection between adjacent cars for a return circuit telephone and electrical signal system, and for electric power transmission, either lighting or motive power.

AUTOMATIC TRAIN TRACK TRIP.—J. S. ALLEN, 115 Broadway, New York, N. Y. This invention provides a trip having a hollow post in which a shaft is journaled, a hood being secured to the top of the shaft and having depending lugs which engage stops on the post for limiting the movement of the hood and the shaft. The hood extends outward from the shaft and has a depending peripheral member for protecting the stops and lugs from the weather. Secured to the hood there is an extending arm which is adapted to be engaged by a contact member carried by a locomotive or car.

RAIL BRACE.—R. SARGENT, Laona, Wis. In this brace clamp members are provided to engage track rails at the outer side, and these are united by a turn-buckle or equivalent to tighten or loosen the clamp members as desired. Associated with the clamp members are bearing plates seating against the rails, and means associated with the clamps to engage the rails at the inside.

CENTERING DEVICE FOR CAR COUPLINGS.—L. BOIRAULT, 58 Rue Taitbout, Paris, France. This invention has reference to a device for the purpose of so directing the coupling of bogie railway cars, when running either on the curved or straight parts of the line, that the head of the coupling will be kept substantially in the axis of such line.

Pertaining to Vehicles.

SNOW PLOW.—J. A. LAWRENCE, 106 Elm St., Valparaiso, Ind. This snow plow is provided with a pivoted thill and draft member to which the tug straps of the harness may be attached, so that the plow may be operated to clean a straight path in the open, in a gutter, or against the building, throwing the snow to either or both sides, irrespective of drifts. Means are provided for locking the draft members in any one of a number of positions relatively to the plow.

VEHICLE WHEEL OR RUNNER.—A. R. MOORE, Box 664, Mt. Vernon, Wash. The invention relates to vehicles in which the tread consists of an endless element that travels around the inner frame or fixed section of the runner. The tread mechanism is provided with anti-friction devices between the outer movable element and the inner fixed element.

AUTOMATIC STARTER.—B. S. WILLIAMS, 17 Arcade, Nashville, Tenn. The invention relates particularly to mechanism for starting internal combustion engines of automobiles. For this purpose a fluid under pressure is employed, and after the engine has started its power is used to replace the fluid in a suitable position for starting again at some future time.

HAND WHEEL.—H. W. DOVER, Park Road, St. James End, Northampton, England. This invention relates to the construction of hand wheels, more particularly to steering wheels of motor cars and the like, which are built up of a peripheral rim, a central hub, and intervening arms. An object of the invention is to securely attach the outer ends of the arms to the rim by means which permit of making the rim itself in an economical manner, and at the same time enabling it to resist efficiently the stresses to which it is subjected.

ENGINE STARTER.—M. MELLER-ZAKOMELSKY, 316 W. 23rd St., New York city. This improved starter for internal combustion engines is particularly adapted for use in connection with automobiles. Adjacent to the chauffeur's seat a lever is provided, which carries a toothed sector engaging a bevel gear affixed to the flywheel. By operating the lever, the chauffeur is enabled to turn the engine shaft without leaving his seat.

LEAF SPRING.—S. F. SMITH, 628 12th St., Oakland, Cal. The object in this case is to provide a flexible leaf spring which automatically responds to slight variation of loads. This is obtained by providing a pair of master leaves to which the loads are applied and between which are positioned a series of superimposing leaves gradually varying in length with the longest leaf adjacent the lower portion of the leaf spring and the upper master leaf contacting with the ends of all the leaves positioned between said master leaves. The leaves of varying length between the master leaves are prevented from displacement by means of connecting the master leaves at certain intervals.

LEAF SPRING.

RESILIENT WHEEL.—W. S. RAIT, Chicago, Ill. An object here is to attach a tire, preferably of solid construction, to a wheel in such a manner as to obtain all the advantages appearing in a pneumatic tire, but, at the same time, avoiding the possibility of the pneumatic tire being injured or punctured.

CRANKING DEVICE.—J. D. HOPWOOD, 712 Huntsville Ave., Boyles, Ala. In this invention the object is to provide a device especially adapted for use with automobiles or with explosion engines in general, and wherein means is provided for preventing reverse movement of the crank in case of back-firing or the like.

Designs.

DESIGN FOR A STATUETTE.—T. B. FORD, 407 Broome St., New York, N. Y. In this ornamental design a winged insect whose head is that of a man with an elongated proboscis is inserted among a mass of ball-shaped forms, all resting on a base.

DESIGN FOR MATERIAL FOR APPLIQUÉ WORK.—O. E. MAUL, 165 Mercer St., New York, N. Y. In this ornamental design for appliqué work, the design shows three rows of twisted material in running loup form, slightly differing from one another, the whole having a line along the edge of the pattern.

NOTE.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Notes and Queries

Kindly keep your queries on separate sheets of paper when corresponding about such matters as patents, subscriptions, books, etc. This will greatly facilitate answering your questions, as in many cases they have to be referred to experts. The full name and address should be given on every sheet. No attention will be paid to unsigned queries. Full hints to correspondents are printed from time to time and will be mailed on request.

(13009) L. R. asks: Will you kindly answer in your Notes and Queries column the following questions about sulphurous acid gas? 1. What is its density as compared with atmospheric air at these temperatures: 40 deg., 60 deg., 80 deg., and 100 deg. Fahr.? A. The density of sulphur dioxide gas is about 2.25 times that of air at the same temperature. Its coefficient of thermal expansion is about 0.002, so that from 40 degrees to 100 degrees it would expand about 0.012, a little over one per cent. 2. As compared with carbon monoxide and dioxide. A. The density of carbon monoxide is 0.907, and of carbon dioxide is 1.529, air being unity. 3. What is its rapidity of diffusion? A. We have no figures for the diffusion of sulphur dioxide into air. 4. What volume of gas from one pound of sulphur? A. By the burning of one pound of sulphur in oxygen, a little more than 11 cubic feet of sulphur dioxide will be formed.

(13010) J. M. asks: 1. I am informed that ice boats can go faster than the wind that fills their sails under certain conditions. Will you kindly explain the reason? A. When an ice boat is sailing by the wind, so that the wind moves less than the length of the boat while the boat moves its length, the boat will go faster than the wind. This is because the friction of the ice is so slight. It can never occur in the water because the boat must push its own weight of water aside every time it moves its own length. This the ice boat does not do. It only overcomes the friction of the ice. It has long been known that an ice boat could go faster than the wind which drove it along. Thirty to forty years ago the question was most hotly discussed, but we have seen no dispute about it for a long time. 2. I attended a lecture recently on light, shade and color. The lecturer told us that the reason of red in the case of red glass, was because it absorbed all other color rays, transmitting red alone. Assuming that red glass absorbs blue and green rays, when we place a blue glass in front of the red glass, why doesn't the blue glass absorb the red rays and leave zero instead of purple? A. If you had a red glass which would absorb all the wave lengths excepting red, and a blue glass which would absorb all the red wave lengths, when the two were placed one over the other no light could come through both glasses. The reason why you get light through a red and a blue glass placed one over the other is that they transmit other waves than those of their simple colors. It is easier to find liquids than glasses which will illustrate this point. If red aniline is dissolved in amyl alcohol and copper chloride in dilute hydrochloric acid, two solutions may be formed which will completely absorb all the light, and this with quite a variation in the depth of the colors of the solutions. The liquids may be put into the same container and shaken up, giving a black liquid. They will rapidly separate again. They will not dissolve in each other, and remain mixed. If the two liquids are put into separate cells, they may be examined by the spectroscope and the absorbing power of each separately or of both together, be measured.

(13011) G. N. G. asks: What becomes of the flame of a match, candle, etc., when same is extinguished? A. The gases which compose the flame of a match are simply cooled below the shining temperature when the match is blown out, and are left in the air where they were and in the same condition. The shining part of the flame is composed of particles of carbon which when cooled are soot, and can often be seen in the air as smoke when they are cooled. In the flame while hot these are transformed by the oxygen of the air into carbonic acid. This is the gas which is the usual product of burning.

(13012) J. T. asks: 1. Why do the sun and moon appear larger when near the horizon? A. The sun and moon appear to be larger when near the horizon by an optical illusion. We contrast them with near objects, and so think them much larger than these objects, as indeed they really are. To destroy the illusion and see them as they appear when high above the horizon, roll a paper tube around a lead pencil, making the tube about 12 inches long. Through this you can only see the moon, and thus cut out the view of intervening objects. With one eye look through this tube; the moon will shrink to its proper size. Then close this eye and open the other. Instantly the illusion returns. Open and close the eyes alternately. The eye which looks through the tube is never deceived, because the tube cuts off all view of intervening objects. This experiment is given in Todd's "New Astronomy," page 241. We send the book for $1.45 by mail, postpaid. 2. When is the North Star directly north, at 96 degrees west of Greenwich, and when is it out the most? A. The North Star is directly north, that is, on the meridian of any place twice in every 23 hours 56 minutes 4 seconds of mean solar time, once above and once below the pole. If you wish the time exactly, for any particular date, we would advise you to apply to the Department of Astronomy of the University of your State. 3. What is the variation of the compass needle at 45 degrees north latitude and 96 degrees west longitude? A. The nearest data we can give you for the magnetic variation at your place is 9 degrees and about 40 minutes east in 1902, but we have no record of the annual change since that time. Your State Survey can doubtless give you figures much later than these.

(13013) H. M. sends us the following, which may be of interest to the readers of the Notes and Queries column: Once the question was asked in your columns how to use gradually food sealed in glass jars. I have found a successful method. White glass nest eggs are sold everywhere for about a cent apiece. As the food is used from the jar, these glass eggs can be put in to fill up. If lacking, a little water can be added. This plan is useful also when canning, when the last one is not filled. Also it admits of using larger jars safely for small families. In summer, any cooked food might be put in jars till next meal or next day.

(13014) C. A. B. asks: I have just read your article on "Lightning Protection for Dwellings." I would like a little information on the striking of lightning. I have understood or read in your paper that when a building is destroyed by lightning, the electricity that causes the destruction comes from within the building, and not from the cloud, as it appears to the eye. The real destruction is caused by an explosion from the passage of the electricity stored in the building to the atmosphere or a cloud. Am I right in this matter? A. When an electrified cloud comes over a place, it draws an equal charge of the opposite kind of electricity up into the surface of the earth, the houses, tree tops, etc. If the cloud is positively charged, the earth underneath has an equal negative charge. A flash of lightning is the combination and mingling of these two charges. In this way, the damage results to the objects in the line of the discharge.

(13015) S. U. C. asks: Why is cow's milk white or nearly so; that is, of what is the white color in milk composed, and where does it come from? Why does it stay white, no matter whether a cow feeds on green grass, ensilage, corn, bran, etc.? A. The whiteness of milk is due to its being an emulsion of fat and other substances in the milk. The whey from cheese is not white, after all these substances are removed from it. All emulsions are white. This is due to the action of the tiny particles in the emulsion upon the light which strikes the emulsion. Soap suds is white for the same reason. It is an effect upon the incident light. The white petals of flowers are still another example. They are cells containing air only.

(13016) E. D. T. asks: I am interested in thermo-electric currents and would like you to answer the following questions in regard to the same: 1. Does a firm contact between two different metals in a closed circuit produce an electric current when the point of contact is heated or cooled to a temperature different from the rest of the circuit? A. A firm contact is absolutely necessary to the production of a thermo-electric current. The electro-motive force is so small that a loose joint would introduce so great a resistance that no current could be detected. 2. If so, why the instructions to solder the joint? All discussion of the matter that I have seen or heard speaks of the joints being soldered. A. The joints are usually soldered to produce as firm a contact as possible. A riveted joint will soon corrode when heated and become loose, or else the oxide in the joint, not being a conductor, would ruin the contact. 3. Does the solder have any effect on the results other than to hold the parts firmly together? A. The solder is for the purpose of holding the joints together and excluding air to prevent corrosion. 4. Can you recommend any book treating on thermo-electricity in large part or perhaps exclusively, and not too technical for the semi-amateur? A. There are no separate text books on thermo-electricity. The best references are to the larger texts of physics, Ganot and others. Valuable articles may be found in our SUPPLEMENT, Nos. 195, 238, 645, 752, 767, 811, 826, 1072, 1531 and 1952, price ten cents each mailed.

(13017) C. M. P. asks: During a recent thunderstorm here, the reverberation was so marked that I write to ask for some explanation of it. Although the flash preceded the thunder by several seconds, indicating some distance, the resulting sound was not only louder after the first report, but the concussion of each successive report was greater, so much so that my house was shaken as if by heavy blasting. It resembled heavy artillery fired at intervals of perhaps a second, totaling from five to eight such reports from each flash, the second, third or fourth being louder and heavier than the first. Can you give any scientific reason for this concussion feature? A. The reverberation of thunder is usually attributed to the reflection of the sound from surfaces of the clouds at different distances from the ear, so that at one moment a large volume of sound and at another a small volume reaches the ear. In the case which you describe, the banks of cloud must have been so placed that several reflections came to you at the same moment, producing a heavy shock. Then too there may have been successive reflections of the sound before it reached you, and so the combined effect was much greater.

NEW BOOKS, ETC.

THE PIGMENTS AND MEDIUMS OF THE OLD MASTERS. With a Special Chapter on the Microphotographic Study of Brushwork. By A. T. Laurie, M. A., Principal of the Heriot-Watt College, Edinburgh, and Professor of Chemistry to the Royal Academy, London. London: Macmillan & Co., 1914. Price, $2.75.

The name of Prof. Laurie should be familiar to readers of the SCIENTIFIC AMERICAN. He will be remembered as the contributor of an article on "The Microphotographic Study of Brushwork," in which he convincingly showed how it was possible by means of the microscope and the camera to distinguish the product of one master from another.

In this book Prof. Laurie systematically analyzes the pigments used in old illuminated manuscripts, in paintings and on colored statuary. He shows how the date of any given art work may often be accurately determined by a chemical analysis of its pigments. By far the most valuable portion of the book, to our mind, is the concluding chapter on Micro-photography. Here the most definite and scientific directions are given for the instrumental study of brushwork. To anyone of scientific leanings this objective method of passing upon the authenticity of a work is much more satisfactory than the conflicting testimony of experts, much of which is merely personal opinion. The more knowledge of Prof. Laurie's kind that the expert can command, the more of an expert he really becomes. Prof. Laurie has presented a decidedly original and instructive work which should do much to improve the present methods of passing upon old masters.

DER GESICHTSAUSDRUCK DES MENSCHEN. Von Dr. med. K. Krukenberg. Stuttgart: Verlag von Ferdinand Enke, 1913. Pp. 264.

The old books on physiognomy contained little if anything of scientific value. They were written by men who were more often visionaries than scientists. Physiognomical research in the past—if it deserves the name research at all—is a curious composition of chiromancy, astrology and phrenology. And yet there can be no question that the subject is one which is not only of great artistic and practical value, but one which lends itself to scientific inquiry. Dr. Krukenberg has succeeded admirably, to our mind, in clearing away the meaningless rubbish that has hitherto been accepted as scientific elucidation, and has written a work on physiognomy which has substantial scientific value. First discussing the facial expression of animals, he lays the basis for his thesis that there is an intimate relation between the musculature of the face and intellectual ability. In an admirable chapter on the physiognomy of primitive human beings, he explains his subject anthropologically. In the "Origin of Human Facial Expression" he discusses the evolution of the face, its physiology and pathology. Such individual organs as the eye, the nose, the ear and the mouth and the part they play in physiognomy are excellently treated. To those to whom a study of the human features is of primary importance Dr. Krukenberg's book may be recommended.

METRIC - ENGLISH AND ENGLISH - METRIC LENGTHS. By G. A. Rossetti. New York: Spon & Chamberlain, 1913. Price, 40 cents.

This is a little pocket-book giving equivalents in millimeters (to five significant figures) of all English lengths from one sixty-fourth of an inch to ten feet, advancing by sixty-fourths of an inch; and equivalents to the nearest sixty-fourth of an inch of all metric lengths from one to three thousand two hundred millimeters, advancing by millimeters.

HANDBUCH FÜR UNTERSUCHUNGSRICHTER ALS SYSTEM DER KRIMINALISTIK. Von Hans Gross, O.Ö. Professor des Strafrechts an der Carola-Francisca Graz. Sechste, Umgearbeitete Auflage. München, Berlin und Leipzig: Verlag J. Schweitzer (Arthur Sellier), 1914.

Prof. Gross's monumental work has long been the standard authority on the scientific detection of crime in Europe. That it should have reached a sixth edition (an edition which may be regarded not simply as a revision of the one which preceded it, but almost as an entirely new work) shows how completely it fills the wants of those students who feel that the *facts* of crime should be studied as well as the *law* of crime. Prof. Gross must be regarded as a pioneer in the field of criminalistics—a science which, following the example that he has set at the University of Graz, is now taught in four European universities and which is intended to teach the criminalist (judge, lawyer, detective) how a crime should be systematically analyzed, both psychologically and physically, in order that the guilty criminal may be most speedily brought to justice. Prof. Gross has introduced the technical methods of physics, medicine, bacteriology and other sciences into a field where there has been nothing but blundering and guessing.

It is amazing to learn from Prof. Gross's two stout volumes what an enormous mass of information he and his disciples have accumulated in the last twenty years. It is still more amazing to find all this information wonderfully systematized and so organically presented that the impression is indubitably conveyed that criminalistics, young as it is, is indeed a science. Only a man of Prof. Gross's encyclopædic knowledge and experience (he was an Austrian Examining and Trial Judge before he became a university professor) could have produced this work. It covers every form of crime and reveals phases of the criminal mind which are probably unknown to the lawmaker, the judge, the criminal lawyer and the police.

The fifth edition of Prof. Gross's Handbuch was translated into English and published in an abridged form in India. It is to be hoped that the sixth edition, a totally new work almost, as we have said, will speedily find an American publisher.

PHOTO-CHEMISTRY. By S. E. Sheppard, D. Sc. (London). (Text-Books of Physical Chemistry, edited by Sir William Ramsay.) London: Longmans, Green & Co., 1914. Crown 8vo.; 461 pp. Price, $3.50 net.

A book belonging to the series of text books edited by Sir William Ramsay requires no special recommendation. The present volume represents an excellent survey of a field of chemistry which is as yet incompletely worked out, and the literature of which is greatly scattered. Just because this is so, a particularly high standard of clearness of exposition should have been aimed at. The reviewer regrets to say that on this point the volume is somewhat disappointing. There is a super-abundance (unnecessary, it would seem) of rather unfamiliar technical terms, some of which (e. g., homodrome, heterodrome) might well have been explained, or else omitted. German influence is shown, not only in the very high order of scientific merit of the book, but also in a much less commendable tendency to run into long sentences. An example of this is found on page 230, a sentence which would betray German influence even if it did not end in a German quotation. Says the author:

"In the ensuing sections, we shall see that the photo-chemical reactions which we are at present considering, initiated and to some extent maintained by coherent radiation from definite light sources, are continued, subsequent to the cessation or shutting off of such intensive radiation, by complementary processes of chemi-luminescence, and that whatever persistent chemical changes go on, there is considerable reason to credit the continuance of the propagation of radiant energy, of light, invisible and visible, which, in the words of a pregnant saying, 'leitet das organische Wesen en.'"

An idea of the scope of the book may be gathered from the chapter headings: I. Historical. II. Measurement of Light Quantities. III. The Energetics of Radiation. IV. Economic and Energetic Relations of Actual Light Sources. V. The Absorption of Light. VI. Statics and Kinetics of Photo-chemical Change. VII. Dynamics of Photo-chemical Change. VIII. Special Photo-chemistry. IX. Radiant Matter and Photo-chemical Change. X. The Genesis of Light in Photo-chemical Change. XI. Organic Photo-synthesis.

A HISTORY OF PENAL METHODS. By George Ives. New York: Stokes & Co., 1914.

A gift of picturesque and virile writing has enabled Mr. Ives to write a history of penal methods which holds the attention like a novel. But exceptional literary gifts are not always accompanied by sound judgment. It is true that vengeance was the old idea of punishment; true that it still plays a predominating part in modern prisons; true that severity of punishment does not deter thieves from stealing, or murderers from killing. But it is not true, as Mr. Ives holds, that the term "prison keeper" is synonymous with corrupt official; that single confinement is invariably injurious to mind and body; and that prisons are necessarily schools for habitual criminals. Modern penologists are well aware that the administration of a prison is fraught with shocking possibilities for corruption, both of keepers and of prisoners; but as the science of prison management advances, as criminologists are supplanting the old-time prison officials, the dangers to which Mr. Ives draws attention are fast being eliminated.

Where Mr. Ives is strongest, where, indeed, we heartily endorse him and wish that every American prison warden would read what he has to say, is that portion of the book in which he deals with the future of penology and with prison reform. He has a fine constructive plan, which, idealistic as it is, strikes us as eminently practicable. Before any reform can be proposed or carried out, it is necessary to study and classify crime. That Mr. Ives has done. He distinguishes between the "impulsive" and the "circumstantial" criminal; in other words, between the emotional type of man, whose hot temper leads him to the commission of an act for which he is afterward deeply remorseful, and the deliberate professional. Only the "circumstantial" or professional type of criminal should be confined, according to Mr. Ives—in a prison, by the way, which seems to us very like the prisons that Mr. Ives has condemned in previous chapters. But what is to be done with the prisoners? Analyze them and treat them according to the analysis, answers Mr. Ives. Those that can be reformed are to be psychically treated. Certain types of criminals (congenital idiots with criminal tendencies, habitual criminals who have been convicted over and over again) he will actually destroy, humanely and painlessly—a proceeding, however, which can hardly be entered upon quite so lightly as Mr. Ives seems to suggest. Some crimes can undoubtedly be eliminated altogether by appropriate legislation, such, for example, as certain forms of blackmailing, which are dependent upon the existence of laws designed to control certain vices which often cannot be controlled.

Mr. Ives's book will set its readers thinking, and that is the best that can be said of any written work.

Recent American and European Express Locomotives

(*Concluded from page 69.*)

been delivered from the Maffei Works, Munich, for service on the Roumanian State Railways. One of the outstanding features of these powerful machines is the exceptional dimensions for European practice of the boiler, which has a heating surface of 3,373 square feet and surpasses the capacity of the boilers of all other European Pacific locomotives. The Schmidt superheater, of 650 square feet heating surface, supplies a steam temperature ranging from 570 to 610 deg. Fahr. The fuel used is oil and soft coal. Oil burning has been adopted, as the Roumanian government owns a number of oil wells which have been extensively developed during recent years, but technical reasons made it desirable to combine coal burning with oil fuel. When the locomotives are descending long gradients or standing in the stations, where the petroleum injection would be interrupted as the boiler is not steaming, the temperature of the firebox and tubes would be reduced and endanger the tightness of the joints. This is avoided by burning a thin layer of coal on the grate. Two petroleum injectors are arranged on the firebox of the "Dragu" pattern. A second series of these locomotives is fitted with one flat flame burner of the Cosmovici pattern. The oil is injected by dry steam taken from the boiler. Both oil and steam are regulated with valves and nozzles. A reheater is arranged, beyond the footplate of the cab, to heat the oil before reaching the injectors. This is also done by live steam, which is taken by piping from the reheater to a warmer coil in the oil tank on the tender.

The boiler barrel contains 254 fire tubes 17 feet 7 inches long. The smokebox is of somewhat remarkable dimensions, having a length of 10 feet 7¼ inches.

Half these locomotives are fitted with a third injector of smaller capacity designed for continuous feeding. The eight-wheeled tender has a capacity of 4,600 gallons of water and 1,320 gallons of oil. The capacity of the coal bunkers is 4 tons. The engines under notice are used on passenger express service to haul trains with a maximum speed of 78 miles per hour.

The general dimensions are as follows:

Steam Pressure	185 lb. per sq. in.
Heating Surface of Firebox	193 sq. ft.
Heating Surface of Tubes	2,530 sq. ft.
Heating Surface of Superheater	650 sq. ft.
Total Heating Surface	3,373 sq. ft.
Grate Area	43 sq. ft.
Diameter of Cylinders	16⅞ in.
Piston Stroke	25½ in.
Diameter of Driving Wheels	6 ft. 1 in.
Weight on Driving Wheels	48 tons
Weight Empty	80 tons
Weight in Working Order	89 tons
Gage	4 ft. 8½ in.

Will the Cyclecar Come Into Its Own?

(*Concluded from page 79.*)

be borne in mind that it is the low cost of upkeep that is the primary desideratum of the cyclecar purchaser, and that, therefore, excellence of design, strength of construction, and reliability of operation should not be sacrificed in order to save a few dollars on the manufacturing cost. Naturally, light weight, without attendant sacrifice in strength of parts, is an important consideration in lowering the cost of maintenance. With a 700-pound cyclecar loaded with two 150-pound passengers, the weight on each tire is but 250 pounds. This comparatively light weight carried by each wheel will not only admit of the use of small tires that cost not over $12 each, but also enables the driver to obtain greater mileage on one set than would be the case were the ordinary weight per inch of tire carried on each wheel. And with the greatest source of automobile upkeep cost reduced to a minimum, gasoline and oil expenses naturally follow suit. Many manufacturers claim that their cyclecar will travel 50 miles on a gallon of gasoline, which may or may not be the case, but even if we reduce this figure by 10 miles to make allowance for possible over-

enthusiasm, the remaining 40 miles per gallon is so far superior to the performance of the average automobile that it becomes, to many men, a powerful argument in favor of the lighter vehicle.

"Granted that the cyclecar possesses these advantages of low initial cost and upkeep, its light weight renders it unavailable for comfortable riding over the average rough country road; it is suitable for the boulevards and well-kept State roads, but is it not entirely a fair-weather and smooth-highway vehicle?" the automobile owner will argue. In reply it should be stated that the cyclecar has upset every common belief in regard to the features of design and construction on which comfortable riding over rough roads depends. It is ordinarily held that a heavy car with a long wheelbase will be able to negotiate rough roads with less attendant discomfort to the passengers than will be the case with a smaller and lighter car; it is argued that the greater weight absorbs the shocks and jars before they are communicated to the occupants of the machine. This is true to a certain extent, but the more comfortable riding found in a heavy car is not due directly to the greater *total* weight, but rather to the greater proportion of sprung to unsprung weight. That is, the wheels, axles, differential, driving shaft, and the like, the weight of which is carried entirely on the tires, represent a certain mass of unsprung weight that is directly affected by the inequalities of the road. All of the remainder of the weight of the car, including body, frame, transmission, motor, and occupants, is mounted on the springs. If the unsprung weight is heavy and the spring-supported weight is light, the shocks imparted to the latter by travel over a rough road would be tremendous. When the reverse is the case, however, the *comparatively* small mass of the unsprung parts reacts through the springs against the much greater mass with but little effect on the latter. Therefore, as motorcycle wire wheels, light axle construction, and the elimination of the differential are features of cyclecar design, the unsprung mass is very small as compared with the spring-supported weight of the frame, body, motor, and occupants, and this results in a wonderful ease of riding that, it is claimed, is oftentimes not found on the most expensive cars when traveling over exceedingly rough roads.

There is another feature of cyclecar construction that is cited as a decided objection by many of its opponents, and that is the narrow tread. But if we are to have a car of minimum weight and cost, the tread must be narrow, for this makes possible the use of shorter and lighter axles and a smaller frame. Furthermore, instead of being forced to follow in the deep ruts of a country road, the cyclecar of 36, 40, or 48-inch tread is able to travel in the center or crown of the road, or to "straddle" one or the other of the ruts. In addition, the low center of gravity of the average cyclecar enables it to run on a sidehill or in a gully without danger of overturning, and if the tread be sufficiently narrow, the side of the road may be taken with ease whenever an obstacle is encountered in the center.

Desiccated and Frozen Eggs

(*Concluded from page 82.*)

room is provided with a system of refrigeration pipes so that the temperature can be kept low enough to prevent the growth of the germs that are always present, even in the best of eggs. The cups into which eggs are broken, and all other utensils, such as cans, etc., that come in contact with the egg meat, show a smooth surface.

The girls who break the eggs are required to be neat and have clean hands. As each egg is broken into a glass cup, the girl smells it, and if she detects an odor, the egg is discarded. There is a large demand for egg-preparations consisting of white or yolk alone, or in various proportions. Therefore, the white is separated from the yolk by means of a simple mechanical device which insures

cleanliness. Dirty eggs are not fit for this work because during separation there is too much danger of contamination with bacteria and fecal matter from the shells. The mere fact that the white and yolk can be separated is a proof of the good quality, because a weak yolk is one of the earliest signs of decomposition, and such an egg cannot be broken without getting the yolk and the white mixed.

The egg meat is transferred to a large, closed mechanical churn provided with a brine cooling jacket, and is thoroughly churned for about half an hour. To make the frozen product, the churned egg-meat is distributed into 50-pound cans, which have first been sterilized in live steam. The cans are immediately transferred to a refrigerator, where the contents are frozen solid in a short time, at a temperature of several degrees below zero. Here they are kept until they are shipped in refrigerated cars to hotels, restaurants, bakers, and dealers.

The egg meat intended for conversion into the dry product, is taken to the drying room as soon as possible after leaving the churn. The drying apparatus consists principally of a long flexible metal belt, which revolves in a hot air chamber, around two big drums. The strong air current applied in drying is filtered and heated by steam coils before coming into contact with the egg meat. The temperature of the air is regulated automatically so that it will never reach a point at which it might coagulate the egg and render it insoluble. Of course, the egg meat never gets as hot as the surrounding air, because it rapidly loses water through evaporation, and this evaporation reduces the temperature. At one end of the hot air chamber the belt is exposed for a short distance, and here the egg mixture runs upon the belt along its whole width, in a continuous stream. The egg meat is supplied by gravity from a large cooled cylindrical tank, which is suspended several feet above the outlet.

The belt makes one complete revolution in 15 minutes. This is sufficient to dry the thin layer of egg, and not long enough to permit a multiplication of the bacteria in it, as it takes the bacteria at least half an hour to divide by fission. As the egg meat is applied to the belt in a continual stream, several layers of egg are superimposed upon each other. When the whole layer of dried egg has reached the desired thickness, the further application of egg is stopped and the thin film of dried egg is scraped off the belt by a mechanical steel scraper. The resulting dry egg is now in the form of fine golden-yellow flakes, which are placed on sieve-trays of various mesh size and exposed to a current of dry-heated air, in a special room. Here the drying process is completed. The finished product, which contains only about 5 per cent moisture, can be kept in cold-storage indefinitely without deteriorating. At room temperature it changes slowly, finally acquiring a fishy odor and losing its solubility.

The conversion of eggs into the frozen and desiccated product should become a great stimulus to the egg industry of this country. In fact, it opens up the European market to the American egg. The cold-storage of eggs only retards, but does not prevent deterioration. With the modern methods of freezing and desiccating eggs, on the other hand, it is possible to obtain a product which retains for a long period the qualities of fresh eggs.

Desiccating also greatly reduces the weight and bulk of the eggs, one pound of the dry product representing about 3½ pounds of the raw egg-meat obtained from 30 eggs. This means an enormous saving in freight and storage charges. When it is remembered that the high price of eggs in our large cities is chiefly due to the high cost of transportation and storage of the bulky shell eggs, and to the great losses arising from their decay and breakage during transit, the value of the freezing and desiccating industries will be appreciated.

In spite of all these advantages, savings and conveniences that the use of frozen and desiccated egg offers, there seems to be quite a popular prejudice

against it. This is due partly to the fact that a few dealers have placed on the market, or sold clandestinely for food purposes, frozen and desiccated rotten eggs. A large amount of eggs that are unfit for food are worked up into so-called "tanners' eggs," to be used in the treatment of fine leathers. In the preparation of tanners' eggs, the sound portion of spot eggs, eggs showing blood-rings, and tainted eggs are used. After desiccation the product can hardly be distinguished by its physical appearance, from a similar preparation obtained from perfectly good eggs. It has been found in a few large Eastern cities that eggs which were supposedly sold to tanners were bought by unscrupulous dealers, deodorized by a trace of formaldehyde, and sold for food purposes with great profits. After such eggs are sold to tanners, it is very hard to keep track of them and they may, in a roundabout way, make their appearance in cheap restaurants and bakeries. Denaturization of such preparations at the factory is the only sure way to prevent their use as food. It is easily possible to find a substance which, when added to tanners' eggs, serves as a telltale without exerting a bad effect upon the leather.

Planting Hair on Bald Heads

(*Concluded from page 83.*)

the scalp is pierced and the hair planted. The instrument is power-driven, the power being transmitted through a flexible shaft *A*. The hair, after being sterilized and otherwise treated to make it as stable as possible, is inserted in a long glass tube *B*, and is fed to the needle by a friction wheel that is concealed in the drawing by the ratchet wheel *C*. As indicated in the detail views, first the needle *D* is fed forward by a crank motion, to puncture the scalp; then the two points of the needle spread open, while the hair, which has been following the needle, is fed into the puncture; thereupon the needle is withdrawn, and a cutter chops off the hair to the desired length. An adjustable plate *E* forms a spacer between the end of the instrument and the scalp, to regulate the depth of the puncture, because scalps of different individuals vary according to their age and general condition of health.

Pending Applications in the Patent Office and How They Are Being Handled

THE Commissioner of Patents has caused a count to be made of all of the applications pending before the Patent Office at the close of business on June 30th, 1914.

The applications may be divided into two classes, namely: First, those which have been finally passed upon by the Office, or in technical language, have been "allowed"; these await the payment of the final fee before the patents are granted; and second, those which have not been finally passed on or allowed.

The count shows the number of applications allowed to be 22,623, and the number not allowed to be 116,832. The total number of applications in the Office is 139,455.

Referring now to the 116,832 applications not yet disposed of, the count has been made as to how long these applications have been pending. The count shows:

The number pending over 15 years.	52
The number pending over 10 years.	241
The number pending over 5 years.	4,231
The number pending over 2 years.	31,677

The number of applications pending over two years includes, of course, all of those enumerated as pending for five, ten, or fifteen years. This count shows, therefore, that in order to limit the prosecution of applications in the office to two years, as the Commissioner is endeavoring to do, it is necessary to dispose of 31,677 applications which have been pending for a longer time, and to prevent any of the remaining 87,155 applications which have been pending less than two years from exceeding the two-year limit. It will, there-

fore, be clear that the problem involves attention to perhaps 50,000 or 60,000 applications.

The Commissioner finds it impossible to press this work, and believes that the progress which he is making is gratifying. A count shows that during the first six months of this year, namely, to June 30th, the number of applications allowed exceeded the number allowed during the first half of last year by 7,979.

These allowances, of course, mean increase in the number of patents granted, and it is mainly this that has given rise to the increase in the surplus referred to, for the cost of printing a patent is considerably less than the final fee charged upon the granting of a patent.

The foregoing figures will indicate that if the policy of reducing the time during which applications are pending in the Office to two years is pressed, the surplus will be still more largely increased, and will be maintained during the number of years necessary to work off the accumulation of the old applications.

The investigation confirms the opinion expressed in the last annual report of the Commissioner that the great bulk of the applications should be disposed of within two years. The considerations which bear upon this problem are numerous, and the problem of fixing a reasonable maximum is not free from difficulty. From the viewpoint of the Office, the main consideration is that the time should not be made so short as to require special attention by the Office to applications which will ultimately be abandoned.

Only about 50 per cent of the applications filed each year eventually become patents. For example, during the past two years 71,301 patents have been granted and 137,297 applications have been filed. The difference of about 66,000 applications represents substantially the number of applications filed and abandoned during those two years. That is to say, there are about 33,000 a year. Any order or policy which would require special attention to these 33,000 applications involves waste of time which should be devoted to the applications ultimately eventuating in patents.

The Commissioner endeavored to ascertain the average life of the abandoned applications, and finds it to be about twenty-eight months. In order to arrive at this figure he has had made an accurate count of the time during which all applications which eventuated in patents during the first half of this year were pending, and he finds the average time to be 21½ months. As there are substantially two years accumulation of cases in the Office, and therefore the average length of life of all those which are pending must be two years, and as about 48½ per cent of the applications filed become abandoned, it follows that the average life of the abandoned applications must be somewhat more than six months in excess of that of the applications which eventuate in patents, making them as indicated, about twenty-eight months.

Abandonment, however, occurs only as the result of a year of entire inactivity in the applications. Therefore, the average active life of the abandoned applications is one and one third years, and in two years the great bulk of them would be out of the way. This seems to be a good reason for making no special rules respecting applications pending not more than two years. Beside this, the Commissioner's own experience satisfies him that two years' time is very frequently honestly required and that a shorter period would be a hardship.

Hence the Commissioner has selected this as the maximum limit of normal prosecution. After the thirty-one thousand and odd applications which have been pending more than that time have been worked off, he thinks it will be appropriate to make a rule that all applications pending in the Office for more than two years shall be brought to the personal attention of the Commissioner. It must, however, be evident that it is impossible for the Commissioner to give his personal attention to all of the applications now pending over two years.

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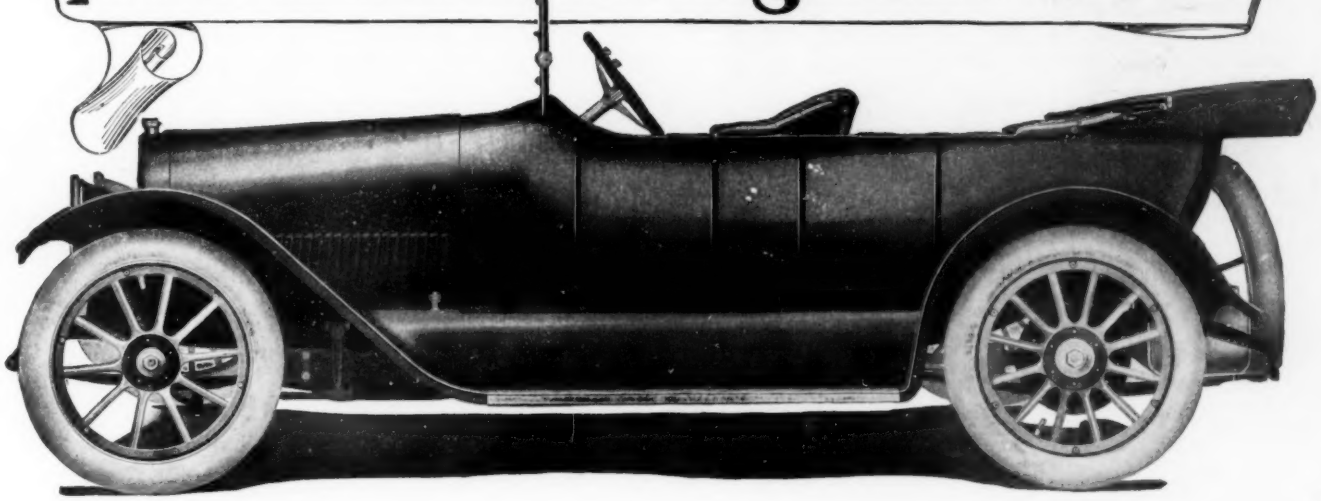

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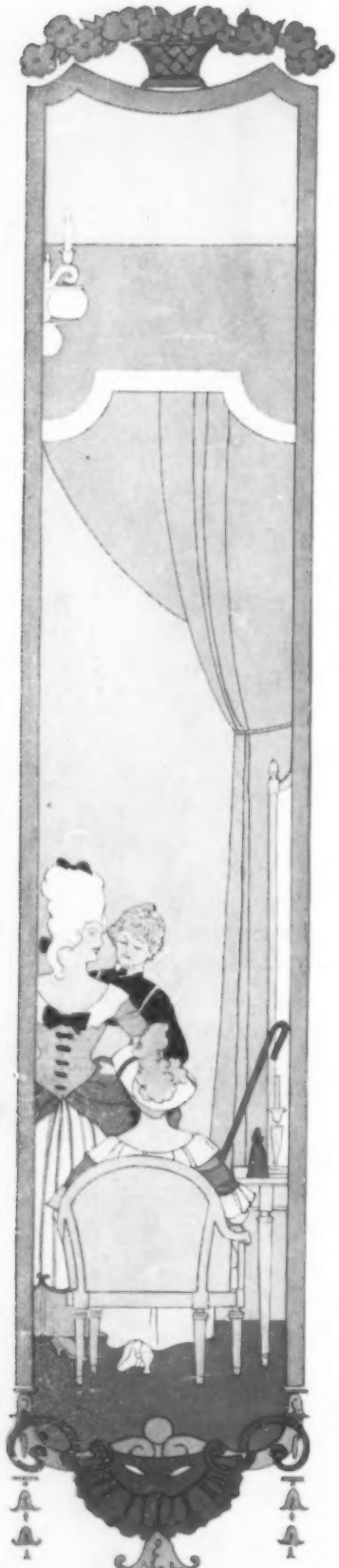

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